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2.3.2

Quality Assurance Project Plan for Activity-Based Sampling, Soil Sampling, Indoor Air Sampling, and Indoor Dust Sampling Revision 3.0

Prepared for

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APPROVALS

Quality Assurance Project Plan for Soil Sampling

Julie Wroble | 06/11/06
Prepared by Julie Wroble
Toxicologist | Date

Brandon Perri for | 06/11/06
Checked by Roy Araki
QA Manager | Date

Alan Goodman | 06/11/06
Approved by Alan Goodman
Remedial Project Manager | Date

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1. PROJECT MANAGEMENT

1.1 DISTRIBUTION LIST

Copies of the completed/signed project plan should be distributed to:

Jed Januch, Investigator	LAB
Laura Castrilli, RSCC	OEA-095
Gina Grepo-Grove, QA Officer	OEA-095
Julie Wroble, Toxicologist	OEA-095
Alan Goodman Remedial Project Manager	Oregon Operations Office 811 SW 6th Avenue, 3rd Floor Portland, OR 97204
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Dee Warren On-Site Manager	CDM 1331 17th Street, Suite 1100 Denver, CO 80202
Brad Hermanson Project Manager	Parametrix 700 NE Multnomah, Suite 1000 Portland, OR 97232

Electronic copies of data are not required unless specifically requested.

At the conclusion of analysis, hard copies of data should be provided to:

Jed Januch, Investigator	LAB
Julie Wroble, Toxicologist	OEA-095
Alan Goodman, Remedial Project Manager	Oregon Operations Office 811 SW 6th Avenue, 3rd Floor Portland, OR 97204

1.2 PROJECT/TASK ORGANIZATION

The following individuals are U.S. Environmental Protection Agency (EPA) staff with responsibility for design and implementation of this project, and will be the primary data users and decision makers:

- **Alan Goodman**, (503) 326-3685 (primary contact) RPM serving as the primary point of contact for the Superfund program and has approving authority for the project.
- **Julie Wroble**, (206) 553-1079, Toxicologist responsible for planning, sample design, data evaluation and risk assessment, and preparing the final report.
- **Brian Brass**, (702) 784-8009, Meteorologist with the EPA Emergency Response Team (ERT) in Las Vegas, responsible for collecting samples and monitoring meteorological conditions on the site during sampling activities.

- **Jed Januch,** (360) 871-8731, Investigator responsible for assisting in the preparation of the quality assurance project plan (QAPP), assisting with collecting samples, and assisting in preparation of the final report.
- **Gina Grepo-Grove**, (206) 553-1632, QA Officer (QAO) responsible for assisting the Investigator in the development of the QAPP, subsequent revisions, amendments, and associated documents, including the scope of work (SOW) for contracting with laboratory support outside of the Manchester Environmental Laboratory (MEL).
- **Laura Castrilli**, (206) 553-4323, Regional Sample Control Coordinator (RSCC) residing in the QA Office, coordinates sample analyses performed by MEL. The RSCC will provide sample numbers for samples that will be analyzed at MEL.

1.3 PROBLEM DEFINITION/BACKGROUND

History of Site

The MBK Partnership (MBKP)/North Ridge Estates (NRE) site is a residential subdivision and the former location of a Department of Defense (DOD) recuperation barracks facility. Many of the buildings were constructed with asbestos-containing material (ACM). The facility was occupied by the DOD from 1944 to 1946. The property was later occupied by the Oregon Institute of Technology (OIT) until 1964.

In 1966, the site was purchased by a private group of investors who demolished up to eighty of the buildings that were on this site and salvaged materials including copper and wood. The property was purchased in 1977 by MBKP, which began development of the site as a residential subdivision called North Ridge Estates (NRE).

In June 2001, the Oregon Department of Environmental Quality (ODEQ) received a report of asbestos-insulated pipe on the surface of a lot in NRE. Analysis of samples of the pipe insulation revealed 10% to 90% asbestos. EPA issued an action memorandum in 2003 to conduct a removal action at NRE. Additional bulk sampling associated with cleanup and assessment activities have revealed amosite asbestos and chrysotile asbestos on properties in NRE.

In 2004, EPA conducted air monitoring experiments involving activity-based sampling at this site revealing that asbestos fibers were released in the air during simulated activities such as children playing in the dirt, rototilling, and weed trimming with a power string trimmer. The results of this sampling event indicated that asbestos fibers present in soil at NRE are released into the breathing zone when certain outdoor activities are conducted. Concentrations ranged from <0.006 to 0.015 fibers per cubic centimeter (f/cc) for phase-contrast microscopy equivalent (PCME) fibers. However, none of these results were collected at currently occupied residences. Therefore, as part of the remedial investigation/feasibility study (RI/FS), activity-based sampling will be conducted at occupied residences as described below. Also, to characterize potential exposures to residents inside their homes, indoor air and dust samples will be collected as described below.

Location

NRE is located in Klamath Falls, Oregon (Latitude 42° 15' 58" North, Longitude 121° 44' 46" West). The impacted properties cover approximately 80-100 acres.

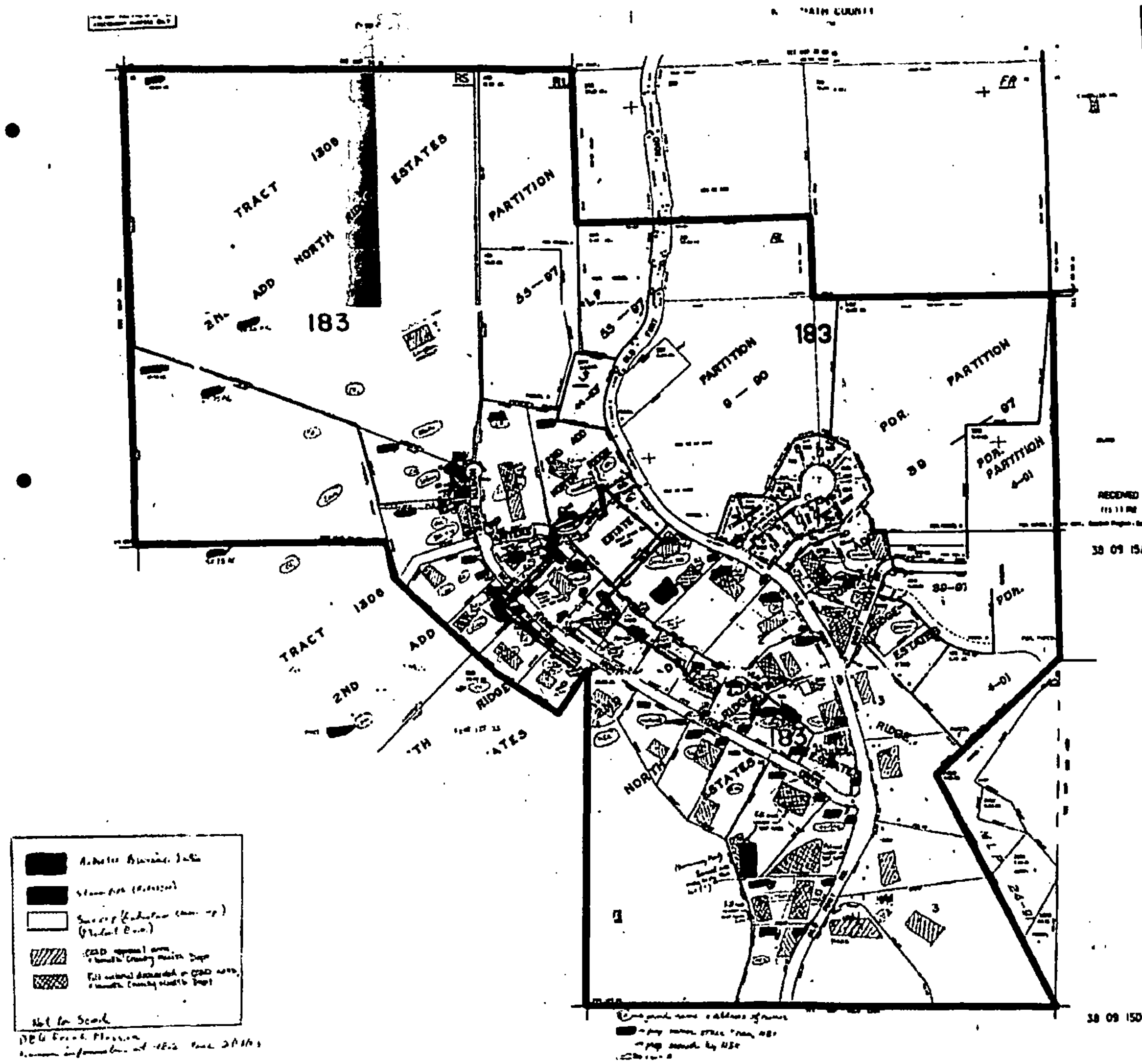

Figure 1-1. Plat Map of NRE

Problem Definition

Asbestos in the soil at NRE is a potential human health risk when it becomes airborne during activities around the home, including yard maintenance and recreational activities. Additional data are needed on the airborne concentrations of asbestos that result when the soil around the residences at NRE is disturbed.

It has been demonstrated that disturbance of soils contaminated with relatively low concentrations of asbestos (<1% by weight) can potentially result in significant airborne concentrations. Recent studies indicate that analysis of air monitoring filters collected during stationary air sampling conducted down-wind from soil disturbance will typically yield fewer fibers than filters from personal monitoring samples. The turbulence and wake effects that occur as air moves around a person's body, as well as the fact that people move around during activity-based sampling experiments, results in personal air data that are more representative of actual exposures than stationary monitory data.

The primary objective for this project is to measure the asbestos concentrations in the breathing zone of individuals engaged in activities such as yard maintenance and gardening around homes at NRE. The specific activities selected for monitoring during this project will be weed trimming, raking, and simulating a child playing. Additional data will be collected on dust concentrations, ACM and asbestos concentrations in the soils in the study area, airborne of asbestos upwind and downwind of activity-based sampling, and meteorological conditions during air sampling.

The secondary objective for this project is to investigate the relative importance of ACM and free asbestos to airborne releases during active soil disturbances. This information will be used to evaluate various remedial options under consideration for the feasibility study.

The tertiary objective for this project is to measure indoor dust asbestos concentrations and personal breathing zone air concentrations for residents who are remaining in their homes at the site. Microvacuum samples of dust collected from within homes will indicate whether asbestos associated with ACM in soil has migrated into homes. Personal breathing zone air samples can be used to evaluate whether remaining residents are being exposed to levels of asbestos in indoor air that might result in elevated human health risks (i.e., greater than an excess lifetime cancer risk of 1 x 10-4).

1.3.2 Project Task Description

The basic field and analytical tasks required to achieve the objectives of this project are listed below:

1. Collect bulk composite and grab soil samples for analysis by polarized light microscopy (PLM) to characterize and quantify the asbestos content of soil within the study area at NRE.
2. Collect air samples with stationary monitors for TEM analysis to determine upwind and downwind levels of asbestos in ambient air while conducting activities.
3. Collect personal dust samples and upwind and downwind dust samples during activity-based sampling using real-time portable devices.
4. Conduct activity-based sampling using personal sampling monitors to collect air samples for analysis by TEM. The TEM analysis will require the services of a contract laboratory.
5. Conduct indoor air samples using personal sampling monitors to collect air samples for analysis by TEM. A backup stationary air sample will be collected and analyzed in the event the personal pump malfunctions. The TEM analysis will require the services of a contract laboratory.
6. Conduct indoor dust sampling using a microvacuum equipped with a filter cassette to be analyzed by TEM. The TEM analysis will require the services of a contract laboratory.

The quality assurance (QA) requirements described in this document are critical to the success of this project and are derived from EPA QA/R-5 EPA Requirements for Quality Assurance Project Plans (March 2001).

Table 1-1 includes a schedule for conducting tasks related to this project. It is intended as a guideline only, as it is possible that unforeseen circumstances and conditions will require adjustment to some or all of the following dates that have been proposed.

Table 1-1. Schedule of Tasks

Activity	Estimated Start Date	Estimated Completion Date	Comments
Asbestos Site-Specific QAPP Review/Approval	May 9, 2006	May 16, 2006	
Sample Collection	June 5, 2006	June 23, 2006	
Laboratory Receipt of Samples	June 26, 2006	June 26, 2006	
Laboratory Analysis	June 26, 2006	July 26, 2006	
Data Validation	July 26, 2006	August 10, 2006	
Draft Report	--------------	September 1, 2006	
Target Date Final Report	--------------	October 30, 2006	

1.4 QUALITY OBJECTIVES AND CRITERIA

EPA has developed a seven-step Data Quality Objectives (DQO) procedure that is designed to ensure that sampling and analysis plans are carefully thought out and that the results of the effort will be adequate to meet the basic objectives of the program. Application of the seven-step DQO process for this project is presented below.

Primary Objective 1 - Measure asbestos levels in the breathing zone of individuals engaged in activities such as weed trimming, raking, and simulating a child playing around occupied homes at NRE.

- Step 1. State the Problem

  The primary issue to be addressed is that remaining residents may engage in outdoor activities that disturb soil, and this might result in unacceptable health risks.

- Step 2. Identify the Decision

  The decision to be made is whether risks to residents who engage in routine activities in their yards are sufficiently elevated given current site conditions at NRE that some sort of short-term action is needed.

- Step 3. Identify Inputs to the Decision

  Data needed to achieve this objective consist of accurate and reliable measurements of asbestos concentrations in the breathing zone of people engaged in activities in their yards. Measurements of asbestos concentrations in breathing zone air will be collected using personal air monitors.

  In addition, soil concentrations will be evaluated in an attempt to understand the relationship between the levels of asbestos or ACM in soil and asbestos concentrations in the breathing zone. Polarized light microscopy (PLM) will be used to evaluate ACM and asbestos levels in soil. Measurements of airborne dust levels also will be made to better understand the relationship between dust emissions and asbestos concentrations in air. Dust will be measured using a downwind aerosol monitor before, during and after each activity.

The number of paired samples (e.g., soil and air) needed for each activity that is investigated is difficult to judge, since it is expected that there could be wide variations between locations in the level of ACM or asbestos in soil and in the amount of soil suspended during each activity. Thus, the range of concentration and risk estimates could vary substantially from case to case. In general, when variability is wide, more samples are needed to support risk management decisions. However, since the activities being evaluated in this study are trial simulations of actual exposures, it is expected that judgments about the relative hazard associated with each activity can be based on only a few samples. Thus, each activity will be performed at 2-4 residences, with one sample of each type (personal air, stationary air, dust, soil) collected at each location.

- Step 4. Define the Study Boundaries

  There are a wide variety of human activities which might result in the generation of elevated levels of asbestos in breathing zone air. The activities selected for evaluation in this investigation are listed below:

  - Weed trimming – this activity was specifically requested by the residents at NRE, since the area is prone to forest fires and weed trimming is needed to remove dry brush during the hot summer months.
  - Raking – this activity was selected for evaluation partly because it is expected to result in relatively high releases of fibers and also because raking likely would be needed after weed trimming to collect trimmed vegetation.
  - Child playing in the dirt – children represent a unique exposure group to consider at sites contaminated with asbestos. Because of their longer lifetime following exposure and the lower height of their breathing zone, they may be especially vulnerable to the risks posed by asbestos exposure.

- Step 5. Develop a Decision Rule

  The level of human health risk from an environmental exposure that requires intervention is a matter of judgment. For the purposes of this project, if the calculated levels of human health risk associated with outdoor disturbances of soil in a yard are larger that EPA's typical default level of concern (1E-04), the EPA will provide information to the resident on how to limit exposure and risk, and may consider options to reduce the level of exposure.

- Step 6. Specify Limits of Decision Error

  Estimation of human health risk from exposure to airborne asbestos during active soil disturbances will be based on measured levels of asbestos in air (collected using personal air monitors). However, all measured values are uncertain. In order to minimize the chances of underestimating the true concentration, the upper 95% confidence limit of the measured values will be used. This ensures that there will be no more than a 5% chance of failing to recognize an unacceptable exposure if it were to be present. In order to ensure that the uncertainty bound around measured concentrations is not excessively wide, all samples will be analyzed to a target sensitivity of 0.001 structures per cubic centimeter (s/cc). This sensitivity is sufficient to detect concentrations that would be of potential health concern for activities that are conducted for limited durations (see Appendix B).

- Step 7. Optimize the Design for Obtaining Results

  Additional air samples or samples from different types of activities may be collected and incorporated into the study results as data become available on actual airborne exposure levels associated with specific types of activity.

Primary Objective 2 – Investigate the relative importance of ACM and free asbestos to airborne releases during active soil disturbances.

- Step 1. State the Problem

  The main source of asbestos at NRE is ACM in the soil. When ACM comes to the surface it begins to release fibers to soil, but this may be a slow process for some types of ACM. Thus, it is considered plausible that simply picking up the ACM on a regular basis might be an effective way to limit human exposure and risk. However, prior activity-based sampling at NRE was conducted in areas with elevated levels of ACM on the ground surface. This current activity is being conducted to determine if removal of surficial ACM would result in significantly different (lower) exposures and risks.

- Step 2. Identify the Decision

  The decision to be made is whether risks to individuals who engage in routine activities in their yards are above a level of concern even if ACM present in the soil surface is picked up.

- Step 3. Identify Inputs to the Decision

  Data needed to achieve this objective consist of accurate and reliable measurements of asbestos concentrations in the breathing zone of people engaged in activities in residential lots. Measurements of asbestos concentrations in breathing zone air will be collected using personal air monitors. These measurements will be made at a location where ACM is present in surficial soils; measurements will also be made at an adjacent location where surficial ACM has been removed by an abatement crew.

  In addition, soil concentrations will be evaluated in attempt to understand the relationship between the levels of asbestos or ACM in soil and asbestos concentrations in the breathing zone. Polarized light microscopy will be used to evaluate ACM and asbestos levels in soil. Dust measurements also will be made to better understand the relationship between dust emissions and asbestos concentrations in air. Dust also will be measured using an upwind and downwind aerosol monitor before, during and after each activity.

  The number of paired samples needed for each activity that is investigated is difficult to judge, since it is expected that there could be wide variations between locations in the level of ACM or asbestos in soil and in the amount of soil suspended during each activity. Thus, the range of concentration and risk estimates could vary substantially from case to case. In general, when variability is wide, more samples are needed to support risk management decisions. However, since the activities being evaluated in this study are trial simulations of actual exposures, it is expected that judgments about the relative hazard associated with each activity can be based on only a few samples. Thus, each activity will be performed at 2-4 residences, with one sample of each type (personal air before ACM removal, personal air after ACM removal, stationary air, dust, soil pre-removal, soil post-removal) collected at each location.

- Step 4. Define the Study Boundaries

There are a wide variety of human activities which might result in the generation of elevated levels of asbestos in breathing zone air. The activities selected for evaluation in this investigation are briefly described below. Note that only one activity likely will be conducted at each property because the goal is to compare air concentrations prior to and following pickup of surficial ACM.

> Weed trimming – this activity was specifically requested by the residents at NRE since the area is prone to forest fires and weed trimming is needed to remove dry brush during the hot summer months.

> Raking – this activity was selected for evaluation partly because it is expected to result in relatively high releases of fibers and also because raking likely would be needed after weed trimming to collect trimmed vegetation.

- Step 5. Develop a Decision Rule

  If all locations investigated by active soil disturbance result in airborne concentrations that are below a level of immediate concern when ACM has been picked up, it will be concluded that repeated ACM pickup is a potential strategy for controlling site risks. If air levels are above a level of concern even after ACM pickup at one or more locations, it will be concluded that this strategy alone may not provide sufficient health protection.

- Step 6. Specify Limits of Decision Error

  Estimation of human health risk from exposure to airborne asbestos during active soil disturbances will be based on measured levels of asbestos in air (collected using personal air monitors). However, all measured values are uncertain. In order to ensure that the uncertainty bound around measured concentrations is not excessively wide, all samples will be analyzed to a target sensitivity of 0.001 s/cc. This sensitivity is sufficient to detect concentrations that would be of health concern from active soil disturbance scenarios (see Appendix B).

- Step 7. Optimize the Design for Obtaining Results

  Additional air samples or samples from different types of activities may be collected and incorporated into the study results as data become available on actual airborne exposure levels associated with specific types of activity.

Primary Objective 3 - Measure asbestos levels in indoor dust and indoor air at occupied residences at NRE.

- Step 1. State the Problem

  Indoor dust may become contaminated with asbestos brought in from outdoor sources, and once contaminated, this indoor dust may serve as an ongoing source of exposure for remaining residents. However, available data are not sufficient to evaluate the potential magnitude of this pathway in the homes of residents who will remain at the site.

- Step 2. Identify the Decision

  The decision to be made is whether risks to residents who remain in their homes are sufficiently elevated, given current site conditions at NRE and that some sort of action or intervention is warranted.

- Step 3. Identify Inputs to the Decision

Data needed to achieve this objective consist of accurate and reliable measurements of asbestos concentrations in the breathing zone of people engaged in routine activities in their homes. Measurements of asbestos concentrations in breathing zone air will be collected using personal air monitors.

In addition, indoor dust concentrations will be measured in attempt to understand the relationship between the levels of asbestos in dust indoors and asbestos concentrations in stationary air and in the breathing zone. Transmission electron microscopy will be used to evaluate air and dust samples collected indoors.

The number of paired samples needed for each residence that is investigated is difficult to judge, since it is expected that there could be wide variations between locations in the level of asbestos in indoor dust and in the indoor air concentrations measured under routine conditions. Thus, the range of concentrations and risk estimates could vary substantially from case to case. In general, when variability is wide, more samples are needed to support risk management decisions. However, since we are relying on the cooperation of residents in attempt to measure actual exposures, we do not want to impart too great a burden on residents for samples collected. Thus, sampling will be performed at 2-4 residences, with one sample of each type (personal air, stationary air, and dust) collected at each location.

- Step 4. Define the Study Boundaries

  For the purposes of this objective, the study boundaries are the residences which will remain occupied within the former footprint of the Marine Recuperation Barracks.

- Step 5. Develop a Decision Rule

  The level of human health risk from an environmental exposure that requires intervention is a matter of judgment. For the purposes of this project, if the calculated levels of human health risk associated with normal activities inside a home are larger than EPA's typical default level of concern (1E-04), the EPA will provide information to the resident on how to limit exposure and risk, and may consider options to reduce the level of exposure.

- Step 6. Specify Limits of Decision Error

  Estimation of human health risk from exposure to airborne asbestos inside a home will be based on measured levels of asbestos in air (collected using personal and/or stationary air monitors). However, all measured values are uncertain. In order to ensure that the uncertainty bound around measured concentrations is not excessively wide, all air samples will be analyzed to a target sensitivity of 0.0001 s/cc. This level of sensitivity is adequate to detect airborne concentrations that would be of potential concern. Dust samples will be analyzed to a target sensitivity of 200 structures per square centimeter (s/cm^2). This sensitivity is adequate to detect asbestos contamination that is unlikely to be of short-term health concern (see Appendix B).

- Step 7. Optimize the Design for Obtaining Results

  Additional air samples or samples from different types of activities may be collected and incorporated into the study results as data become available on actual airborne exposure levels associated with specific types of activity.

1.5 SPECIAL TRAINING AND CERTIFICATION

The field staff conducting this study have completed, at minimum, the 40-hour training in Basic Health and Safety, have completed respirator fit testing, and are enrolled in medical monitoring. In addition, they have completed an 8-hour health and safety training refresher course within the last year, and first aid and CPR training.

The laboratory performing the analysis of composite bulk samples by PLM for this project should be accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) as sponsored by the National Institute of Standards and Technology. The EPA Region 10 Laboratory is exempt from the NVLAP requirement.

The laboratory performing analysis of air samples by TEM for this project will be capable of performing the procedures required by the analytical methods requested. In addition, the laboratory will be accredited for TEM analysis under NVLAP.

1.6 DOCUMENTS AND RECORDS

It will be the responsibility of the QA officer to ensure that appropriate project personnel have the most current approved version of the QAPP including updates. The final version of the QAPP and any updates will be distributed as PDF files.

Field documentation may include but is not limited to field notes, photographs, and sample data and chain-of-custody forms. Laboratory documentation may include but is not limited to raw data, sample preparation and analysis logs, and results of calibration and quality control (QC) checks.

The field and laboratory documentation will be kept in a case file and submitted to the Superfund Program with the final report. The following documents will be archived at the laboratory: (1) signed hard copies of sampling and chain-of-custody records, and (2) electronic and hard copy of analytical data. The laboratory will store all sample receipt, sample login, and laboratory instrument documentation for a minimum of seven years.

2. DATA GENERATION AND ACQUISITION

The elements discussed in Sections 2.1 – 2.10 are designed to ensure that appropriate methods for sampling, measurement and analysis, data collection, data handling, and quality control (QC) activities are employed and documented.

2.1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

The types of samples collected during this project will consist of potential asbestos source materials (soil, ACM, outdoor dust and indoor dust) and samples of indoor and outdoor air (drawn through a filter). For activity-based sampling at occupied residences, a minimum of 2 composite bulk soil samples, 1 grab soil sample, and 3 activity-based air samples will be collected per location. The sampling location will be defined as occupied residences within the study area at NRE and will consist of several locations where gardening and lawn maintenance activities are likely to take place. At each residence, if permission is granted, 2 indoor composite dust and one personal air sample also will be collected. In the event that the resident does not want to wear a personal pump, a stationary air monitor will be used to collect indoor air data. Indoor sampling will be done at a maximum of 4 locations. Activity-based sampling will also be done to determine whether ACM removal results in decreases in air concentrations as measured using activity-based sampling. This sampling activity will be conducted at side-by-side locations. For ACM pickup locations, ACM will be first picked up, 2 composite soils samples will be collected for analysis by PLM, and then activity-based sampling (e.g., raking) will be conducted. At the adjacent location, ACM is left in place, 2 composite soils samples will be collected for analysis by PLM, and activity-based sampling will be conducted. The measurement parameter of interest is asbestos (primarily chrysotile and amosite).

2.2 SAMPLING METHODS

The collection of environmental samples for this project will be done in accordance with applicable EPA standard operating procedures and the sections of appropriate analytical methods that address sample collection. Additional details on how sampling will be conducted are presented in Appendix A.

Composite Bulk Soil Samples

Composite bulk soil samples will be collected using a grid pattern within each study area. The samples will be collected with new/clean disposable stainless steel trowels and will be placed in new/clean zip top plastic bags. Sample containers will be identified by writing, with permanent ink marker, the name of the site, sample number, date and time of collection, and the analysis requested on the surface of the container. In addition to the zip top, the plastic bag will be double bagged and a custody seal placed over the opening.

Air Samples

Air samples will be collected with both personal and stationary monitors located within each study area. Air samples will be collected using 25 millimeter (mm) filters composed of mixed cellulose ester (MCE) media with a 0.8 micrometer (μm) pore size. The filters are sealed by the manufacturer in plastic sampling cassettes which have a connection for the sampling pump on the top (outflow) end and an electronically conductive cowl on the open face (inflow) end. During air sampling the open end should be faced in a downward direction. The filter cassette should be connected to the sample pump with flexible plastic connecting tubing.

Battery-powered personal air-monitoring samples will be collected from the breathing zone(s) of the participant(s). The flow rate will average between 2-10 liters of air per minute (L/m) and the duration of sampling will approximately 2 hours, resulting in a total volume of air sampled between 240 – 1200 liters.

Stationary air samples will be collected with either battery-powered or AC powered sampling pumps which will operate over a 4 to 8 hour period at a flow rate of at least 2-10 liters per minute to achieve a total volume of 480 to 4800 liters of air. The filter cassettes will be suspended from rigid metal stands approximately 4 to 5 feet in height.

Indoor Dust Samples

Indoor dust samples will be collected from each of the occupied residences located in the former footprint of the marine recuperation barracks. Composite dust samples will be collected in accordance with ASTM D5755-95. These samples are intended to provide a representative composite of the dust inside the house, especially in living areas. Briefly, a pump fitted with a filter cassette and a piece of flexible tubing is used to vacuum areas within a template to measure asbestos fibers present in dust. The filters can be analyzed using electron microscopy, similar to the analysis for air samples.

Health and Safety

When working with potentially hazardous materials, investigators are to follow USEPA, OSHA and site-specific health and safety procedures. During sampling and activity-based monitoring events, a full-face air purifying respirator will be used in conjunction with high efficiency particle arrestance (HEPA) filter cartridges (P-100 or equivalent). Additional personal protection equipment (PPE) including Tyvek® coveralls, protective gloves and foot wear will also be used. Indoor personal air sampling will be conducted in Level D and outdoor activity-based sampling will be conducted in Level C. When possible, a backpack or belt will be used for carrying personal sampling pumps. The backpack or belt will be constructed of a material that is easy to decontaminate or dispose of.

Additional health and safety procedures will be defined in a site-specific health and safety plan that will be prepared and approved by the Region 10 Health and Safety Officer prior to conducting sampling.

2.3 SAMPLE HANDLING AND CUSTODY

Each sample will be identified with a unique sample number assigned by the RSCC. EPA Region 10 chain-of-custody procedures and forms will be used. Custody seals will be placed on all sample containers during transit to the laboratory. Samples will be either hand-delivered by EPA or shipped via commercial delivery service.

Handling Air and Dust Monitoring Cassettes

1. An adhesive tag will be fastened to each filter cassette. The tag will display the date, sample number, pump number, time on and time off, and average flow rate for the air sample.
2. The sampling cassettes will be placed upright in a rigid container so the cassette cap is on top and cassettes base is at the bottom. Non-static packing material will be used to prevent jostling damage.

2.4 ANALYTICAL METHODS

Bulk soil samples will be prepared for analysis according to Appendix A Attachment 3 and analyzed by PLM in accordance with method EPA/600/R-93/116, titled *Test Method for the Determination of Asbestos in Bulk Building Materials* or equivalent. The detection limit for this method is generally 1% asbestos by weight. Ten percent of the soil samples will be analyzed by TEM for presence/absence confirmation, mineralogy, and fiber length.

Air monitoring samples and dust samples will be analyzed by the ISO 10312 method for determination of asbestos fibers by direct transfer transmission electron microscopy. For TEM analysis, the microscopist will record the size (length and width) and the type (chrysotile, amphibole, or non-asbestos) of the fiber. The counting rules are specified in the analytical method. The analytical sensitivity and detection limit is a function of the volume of air drawn through the filter and the number of grid openings counted. The target analytical sensitivity for activity-based air samples is 0.001 s/cc. The target analytical sensitivity for indoor personal air samples and all stationary air samples for this project is 0.0001 s/cc. The target analytical sensitivity for dust samples for this project is 200 s/cm^2.

For activity-based samples, the person performing the activity will wear two pumps set at two different flow rates. The reason for this is that activities that generate dust may result in overloading the filter. Ideally, the filter associated with the higher flow rate pump would be analyzed; however, if this filter is overloaded, then the filter associated with the lower flow rate pump would be analyzed. In the event that both samples for a given activity and location are overloaded, then the sample may be analyzed by ISO 13794 method for determination of asbestos fibers by indirect transfer transmission electron microscopy (TEM). In the event that any dust samples are overloaded, then ASTM D5755-95 may be used for indirect analysis by TEM. Indirect sample results may be more difficult to relate to action levels than direct measurements; however, these data are preferable to data gaps.

2.5 QUALITY CONTROL

The following QC activities will be performed by laboratories performing analytical services in support of this project.

Composite bulk samples by PLM

Negative Controls – A blank slide must be prepared before analysis of each set of samples. A sample of isotropic non-asbestos material such as fiberglass (SRM 1866a) should be mounted in a drop of refractive index liquid on a clean slide. Preparation tools including forceps and dissecting needle should be rubbed in the drop of liquid and a clean cover slip should be placed on the drop. The entire area under the cover slip should be scanned by PLM to detect asbestos fiber contamination. If asbestos fibers are detected, the test should be repeated using a clean slide and cleaned preparation tools. If asbestos fibers are still found, the refractive index fluid should be checked and replaced if needed.

Duplicate Analysis (intra- and inter-analyst precision) – The analyst will perform 2 independent measurements at a frequency of 1 out of every 10 samples to determine the ability of the analyst to repeat a measurement. At least 1 out of every 10 samples should be re-analyzed by another analyst.

Reference Sample Analysis – The analyst will perform analysis of a material with a known concentration of asbestos. Material suitable for analysis can include NIST SRM 1866a chrysotile and amosite.

Precision and Accuracy – For PLM analysis, the precision and accuracy should be measured according to the procedures in Section 2.2.4 of Method EPA/600/R-93/116. The laboratory should demonstrate analyst accuracy according to the guidelines set forth by the National Institute of Standards and Testing (NIST)[1]. At least 30% of the quality control samples analyzed should contain between 1% and 10% asbestos.

Air and Dust Sample Analysis by TEM

Blank and QC Determinations – A minimum of two unused filters from each filter lot used for this project will be analyzed to determine the mean asbestos structure count. If the mean count of all types of asbestos structures is found to be more than 10 structures per square millimeter (s/mm^2) or if the mean count for asbestos fibers and/or bundles longer than 5 microns (μm) is greater than 0.1 s/mm^2, the filter lot should be rejected. Two filter lot blanks will be analyzed both for air and dust samples.

The analysis of blanks shall be performed in such a manner as to achieve equivalent analytical sensitivity (number of grid openings counted) as to be comparable to those of the sample set.

Negative Controls – A minimum of two laboratory QA blank filters will be prepared and analyzed by TEM for this project. The laboratory blank filters shall be left uncovered during preparation of the sample sets, and wedges from the blank filters shall be prepared along side the wedges of sample filters.

Precision and Accuracy – For TEM analysis, the precision and accuracy should be measured according to the procedures in Section 10.3 of Method ISO 10312.

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field Instruments

Field instruments such as sampling pumps, rotometers, meteorological monitors, personal dataRAMs, stationary dataRAMs, and other equipment required for sample collection and field monitoring will be maintained according to the manufacturers' instructions and the field unit SOPs. Records for equipment service shall be maintained and be made available on request. Sampling pumps used during activity-based sampling will be cleaned with a HEPA vacuum and wiped with a damp cloth between sampling locations.

Lab Instruments

Laboratory instruments such as microscopes, energy dispersive X-ray analyzer (EDXA), computers, plasma asher, and other equipment required by the applicable analytical methods will be maintained according to the manufacturers' instructions and the laboratory's SOPs. Records for equipment service shall be maintained by the laboratory and be made available to EPA on request.

2.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field Instruments

Pumps used for air sampling will be calibrated in accordance with EPA-ERT SOPs (#2015 Asbestos Air Sampling). The calibration will be performed in the field using rotometers that

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[1] Guide for Quality Control on the Qualitative and Quantitative Analysis of Bulk Asbestos Samples, Version 1, NISTIR 5951.

have been calibrated against a primary standard. Field calibration will be done both pre and post sampling to determine the average air flow rates during the collection of air-monitoring samples.

Laboratory Instruments

Laboratory equipment will be calibrated using the method and frequency specified in the laboratory SOPs.

2.8 INSPECTION/ACCEPTANCE OF CONSUMABLE SUPPLIES

Consumable supplies in the field will consist primarily of filter cassettes and plastic sample containers. Consumable supplies in the laboratory will consist of reagents, copper TEM grids, and SRMs. QC samples of consumable supplies, including but not limited to filter cassettes, will be analyzed as blanks. The quality of SRMs and other consumable supplies such as plastic sample bottles used for this project should be documented by the supplier and certificates should be available to EPA on request. EPA Region 10 field staff use only QC class sample containers.

2.9 NON-DIRECT MEASUREMENTS

Non-direct measurements may be acquired through review of previous sampling and analysis activities conducted by either EPA, agencies with the State of Oregon, or contractors currently or previously involved with analysis of samples from this site. These types of data may be used for planning purposes for this project. The data acquired through non-direct measurement should be reviewed by the EPA QA office to ensure it meets minimum standards and acceptance criteria.

2.10 DATA MANAGEMENT

A field log notebook, photos, and the Field Sample and Chain-of-Custody Data Sheets will be used to document the sampling activities. The Field Sample and Chain-of-Custody Data Sheets will have the following information: site name, sample number, date and time of each sample collection, and the sampler's name or initials. For fixed laboratory analyses, field duplicates will be assigned a separate unique sample identifier and will be submitted "blind" to the analytical laboratory. Example field sample data sheets are included in Appendix C.

All data generated during this project will be processed, stored, and distributed according to the laboratory's SOPs.

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3. ASSESSMENT AND OVERSIGHT

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. Any deviation from guidance documents and their impact on the DQOs will be discussed in the Summary Field Investigation Report. These reports also serve to keep management current on field activities. Assessment and oversight reports are discussed in Sections 3.1 and 3.2.

3.1 ASSESSMENTS AND RESPONSE ACTIONS

Performance assessments are quantitative checks on the quality of a measurement system and may be used for analytical work. Due to the brevity of this investigation effort, field audits will not be completed.

Performance assessments for the laboratory may be accomplished by submitting reference material as blind reference (or performance evaluation) samples. These assessment samples are samples with known concentrations that are submitted to the laboratory without informing the laboratory of the known concentration. Samples will be provided to the laboratory for performance assessment upon request from the EPA. Laboratory audits may also be conducted upon request from the EPA. The Parametrix team will be responsible for tracking the quality of data received from laboratories. If consistent quality issues are discovered, the Parametrix team may recommend that a laboratory audit be performed.

Response actions will be implemented on a case-by-case basis to correct quality problems. Minor response actions taken in the field to immediately correct a quality problem will be documented in the applicable logbook and verbally reported to the Parametrix project manager. For verbal reports, the Parametrix project manager will complete a communication log to document that response actions were relayed to him. The Parametrix project manager and the EPA RPM will approve major response actions taken in the field prior to implementation of the change. Major response actions are those that may affect the quality or objective of the investigation.

Corrective action procedures that might be implemented from QA results or detection of unacceptable data will be developed if required and documented on a Corrective Action Form (see Attachment 2).

3.2 REPORTS TO MANAGEMENT

Field staff will note any quality problems in the field logbooks. The Parametrix project manager will inform EPA upon encountering quality issues that cannot be immediately corrected. A summary QA report will be submitted to the Parametrix project manager by the field QA manager daily. Topics to be summarized regularly may include but not be limited to: activities and general program status, project meetings, corrective action activities, any unresolved problems, assessment of data deficiencies, and any significant QA/QC problems not included above.

If, for any reason, the schedules or procedures above cannot be followed, the project manager shall complete the Sample Alteration Form (SAF) in Attachment 1. The SAF should be reviewed and approved by the QAO. The laboratory should be given a copy of the QAO-approved SAF for reference and the project file.

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4. DATA VALIDATION AND USABILITY

4.1 DATA REVIEW, VERIFICATION, AND VALIDATION

Data Verification

Data verification is a consistent and systematic process that determines whether the data have been collected in accordance with the QAPP.

Data Validation

Data validation is an evaluation of the technical usability of the verified data with respect to the planned objectives of the project. Data validation is performed external to the laboratory by applying a defined set of performance criteria to the body of data in the evaluation process.

4.2 VERIFICATION AND VALIDATION METHODS

Data Verification

Data verification will include a review of the findings of all QA assessment activities including:

1. Field collection procedures
2. Sample labeling methods
3. Chain-of-custody procedures
4. Assessments of analytical data collection, recording, and reporting

If any deviations are identified, the potential impact of those deviations on the reliability of the data will be assessed, and the information will be provided to the project manager.

Data Validation

Data validation consists of evaluation of all individual samples collected and analyzed to determine if the results are within acceptable limits. Quantitative or qualitative limits of acceptability are defined for precision, accuracy, representativeness, comparability, and completeness.

1. Precision: This is defined as the agreement between a set of replicate measurements without assumption and knowledge of the true value. Agreement is expressed as either the relative percent difference (RPD) for duplicate measurements or the range and standard deviation for larger numbers of replicates. Data on precision are obtained by analyzing duplicate and replicate samples.
2. Accuracy: Accuracy is a measure of the closeness of a sample analysis result to the "true" value. Accuracy will be determined primarily by an evaluation of the agreement between repeat analyses, both within and between laboratories.
3. Representativeness: This is defined as the degree to which data accurately and precisely represents characteristics of a population, parameter variations at a sampling point, or an environmental condition. For this project, representativeness will be ensured by selection of sampling locations in accordance with the sampling design requirements in this QAPP.

4. Comparability: Data are comparable if collection techniques, measurement procedures, methods, and reporting units are equivalent for the samples within a sample set. Comparable data for this project will be obtained by specifying standard units for physical measurements and standard procedures for sample collection, processing and analysis.

5. Completeness: Data are complete when a prescribed percentage of the total intended measurements and samples are obtained. Analytical completeness is defined as the percentage of valid analytical results requested. For this project, acceptable completeness should be > 90%.

4.3 RECONCILIATION WITH USER REQUIREMENTS

All data and related information obtained during the course of this project will be included in a data report package.

Table 4-1. Sample Information Summary

Project Sampling Schedule[a]	Parameter/ Limits	Design Rationale	Sampling Design Assumptions	Sample Selection Procedures	Measurement Classification (Critical/Non Critical)	Nonstandard Method Validation
Outdoor Activity-Based Personal Air	Asbestos Sensitivity level of 0.001 f/cc	To determine the levels of airborne contaminants generated by performing specific outdoor residential activities at the site.	The residential activities release asbestos fibers to the air.	Samples will be collected from potentially contaminated areas.[b]	Critical	PCM filter utilized.
Soil	Asbestos Sensitivity level of 0.25%	To determine the levels of asbestos in soil in areas where activity-based sampling is performed.	ACM contributes to asbestos contamination in soil.	Samples will be collected in areas with observed ACM.	Critical	na
Indoor Dust	Asbestos Sensitivity level of 200 f/cm^2	To determine the levels of asbestos in indoor dust	Fibers released from ACM/soil have migrated to or been carried into homes	Samples will be collected from locations where dust may be expected to collect	Critical	na

Table 4-1. Sample Information Summary

Project Sampling Schedule[a]	Parameter/ Limits	Design Rationale	Sampling Design Assumptions	Sample Selection Procedures	Measurement Classification (Critical/Non Critical)	Nonstandard Method Validation
Indoor Personal Air	Asbestos Sensitivity level of 0.0001 f/cc	To determine the levels of asbestos in breathing zone air to a resident performing routine activities	Fibers released from ACM/soil have migrated to or been carried into homes	Samples collected for one day are representative of routine personal exposures	Critical	PCM filter utilized

[a] All samples will be collected during the field event. The listed item is the decision area.

[b] As indicated from previous investigations at the site and from on-site observations.

Key:

Critical = Required to achieve project objectives or limits on decision errors

na = not applicable

Table 4-2. Data Quality Objectives Summary

Analytical Group	Number of Samples	# of QA Samples: Field Dups / Field Blanks / Lot Blanks/ Reference Samples	Matrix	Method	Method Detection Limits	Accuracy	Precision (RPD)	Complete-ness	Volume, Container	Holding Time (days)
Laboratory Measurements										
Asbestos PLM	21	1 SRM 1866a	Soil	EPA/600/R-93/116	1%	Per method	Per method	> 90%	Zip top bag	None
Asbestos TEM	51	2 field blanks per set of samples; 2 lot blank per cassette lot	Air filter	ISO 10312	0.001-0.0001 s/cc	Per method	Per method	> 90%	Cassettes in re-sealable bags	None
Asbestos TEM	9	1 field blank per set of samples; 2 lot blanks per cassette lot	Air Filter (from Microvac)	ISO 10312	200 s/cm^2	Per method	Per method	>90%	Cassettes in re-sealable bags	None

Table 4-3. QA/QC Analytical Summary and Fixed Laboratory Analytical Methods

Laboratory	Matrix	Parameters/Method	Method Description/ Sensitivity	Total Field Samples[a]	Method Blank	Duplicates	Lot Blanks	Trip Blanks	Total Field and QA/QC Analyses/ Containers[b]	Precision and Accuracy
Commercial Laboratory	Air (Activity-based samples)	TEM Asbestos/ ISO 10312	TEM/ 0.001 f/cc	16	na	1	1	na	18	Per ISO Method
Commercial Laboratory	Air (Outdoor Stationary Air samples)	TEM Asbestos/ ISO 10312	TEM/ 0.0001 f/cc	32	na	1	1	na	34	Per ISO Method
Commercial Laboratory	Air (Indoor Personal Air samples)	TEM Asbestos/ ISO 10312	TEM/ 0.0001 f/cc	2	Na	1	1	na	4	Per ISO Method
Commercial Laboratory	Air (Indoor Stationary Air samples)	TEM Asbestos/ ISO 10312	TEM/ 0.0001 f/cc	4	na	1	1	na	6	Per ISO Method
Commercial Laboratory	Soil	PLM	1%	21	na	1	na	na	22	
Commercial Laboratory	Soil (confirmation)	TEM	1%	2	na	1	na	na	3	
Commercial Laboratory	Dust	ISO 10312	200 s/cm^2	4-8	na	1	1	na	6-10	
Commercial Laboratory	Soil Moisture	ASTM D 2216-90	Gravimetric/ NA	4	na	1	na	na	5	
Commercial Laboratory	Grain Size	ASTM D 422	Sieving-Visual/ NA	4	na	1	na	na	5	

[a] Total number of field samples is estimated.

[b] Total analyses and containers includes both field and QA/QC aliquots to be submitted for fixed laboratory analysis.

Key: cc = Cubic centimeter; ISO = International Organization for Standardization; na = not applicable; PLM = Polarized light microscopy; QA = Quality assurance; QC = Quality control; s = structures; TEM = transmission electron microscopy

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ATTACHMENT 1

Sample Alteration Form

Sample Alteration Form

Project Name and Number: ____

Material to be Sampled: ____

Measurement Parameter:

Standard Procedure for Field Collection & Laboratory Analysis (cite reference):

____

Reason for Change in Field Procedure or Analysis Variation:

____

Variation from Field or Analytical Procedure:

____

Special Equipment, Materials or Personnel Required:

____

Initiators Name:____________________________________ Date:______________

Project Officer:____________________________________ Date:______________

QA Officer:____ Date:______________

ATTACHMENT 2

Corrective Action Form

Corrective Action Form

Project Name and Number:____

Sample Dates Involved:____

Measurement Parameter:____

Acceptable Data Range:____

Problem Areas Requiring Corrective Action:____

____

____

____

Measures Required to Correct Problem: ____

____

____

Means of Detecting Problems and Verifying Correction: ______________________

____

____

Initiators Name:______________________________ Date:______________

Project Officer:______________________________ Date:______________

QA Officer:______________________________ Date: ______________

APPENDIX A

Activity-Based Sampling Plan

Activity-Based Sampling Plan

Prepared for

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ACTIVITY-BASED SAMPLING

Background

It has been demonstrated that disturbance of soil with low levels of asbestos (<1%) can potentially result in significant exposures in the breathing zone. Recent studies also indicate that stationary air sampling conducted directly downwind from activities will typically produce lower results or fiber counts than personnel samples. Stationary samples are not necessarily representative of potential exposure. The turbulence and swirling caused to an air stream by a person standing in a wind tunnel are well documented. These turbulence and wake effects, in the wind tunnel as in the real world, are particularly important when airborne contaminants are generated directly by an individual's activity due to near field effects, making personal sampling especially advantageous. Also, personal sampling is necessary because people are rarely stationary and will move throughout an area. Therefore, total exposure is an accumulation of exposures from different points in space and time.

Since personal monitoring is more representative of actual exposure than stationary sampling, personal monitoring results are more expedient. Since it is often impractical and likely unethical to collect air samples from ordinary citizens where they could potentially be exposed to a hazard, EPA developed a process called activity-based sampling. In activity-based sampling, EPA and contractor personnel who are trained in hazard recognition and mitigation serve as a surrogate for the populace. Activity-based sampling simulates routine activities in order to project potential exposure from disturbance of potentially contaminated materials. Similar sampling approaches have been used to assess exposures to pesticides and lead.

This SAP provides guidelines and standard scripts to simulate the activities of adults and children conducting a variety of routine activities such as trimming weeds, raking, and playing.

Sample Collection Information

Applicable sample collection Standard Operating Procedures (SOPs) will be followed, including the following. Copies for these SOPs are found in Attachment 4.

- EPA Emergency Response Team (ERT)/General Field Sampling Guidelines (ERT SOP #2001)
- Field Activity Logbooks, Sample Packaging, Soil Sampling (ERT SOP #2012).
- General Air Sampling Guidelines (ERT SOP #2008).
- ASTM D5755-95 Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by TEM for Asbestos Structure Number Concentration, and Sampling Equipment Decontamination (ERT SOP #2006).
- Applicable SOPs and guidelines within the EPA ERT SOP #2015, Asbestos Sampling.
- Analytical Protocol for ACM-Contaminated Soil (Golloway Protocol).
- International Organization for Standardization (ISO) 10312, Ambient Air B Determination of Asbestos Fibers: Direct-Transfer Transmission Electron Microscopy Method will be followed.

The individual conducting the activity will be fitted with two pumps at different flow rates (e.g., 5.0 liters/minute and 2.5 liters/minute) with the inlet positioned at approximately the same position on the subject within the breathing zone. If loading levels exceed the analyst's ability to read the 0.8-micron filters, the activity will be repeated with the flow rate adjusted so that samples may be read via a direct analytical method.

Activity-Based Air Sampling For Asbestos

This section describes activity-based sampling guidelines to assess potential human health exposure impacts caused by exposures to asbestos during the specified activities. This sampling event is being conducted to represent site conditions during a great deal of physical activity and should represent exposure to airborne fibers under a worst-case scenario. To minimize exposure to residents during activity-based sampling, we will restrict access to the site areas where activity-based sampling will be conducted (up to 300 feet away). We also will coordinate these sampling events with residents so they can choose to be away from home on the day these activities are conducted on their properties. However, previous experience indicates that concentrations decrease dramatically with distance from the activity. We do not anticipate relocating residents as we expect the highest concentrations to be immediately surrounding the worker.

For all activity-based sampling events, except as noted otherwise, asbestos samples will be collected from the breathing zones of the event participants at flow rates typically ranging from 2 to 10 liters per minute (l/min) for approximately 2 hours, for a target volume of 240 to 1200 liters (l). Specific breathing zone heights should be determined on a project-by-project basis, based on the anthropometrics for the study population and the participants' positions during the performance of each task. The breathing zone can be visualized as a hemisphere approximately 6 to 9 inches around an individual's face. Breathing zone samples provide the best approximation of the concentration of contaminants in the air that an individual is actually breathing. For each activity-based sampling event, upwind and downwind stationary air samples and upwind and downwind dust measurements will be collected.

For all asbestos sampling, an asbestos sampling train consisting of 0.8-micron (μm), 25-millimeter (mm) mixed cellulose ester (MCE) filter connected to a personal sampling pump will be used. The top cover from the cowl extension on the sampling cassette shall be removed ("open-face") and the cassette oriented face down for all asbestos filters. All samples shall be collected open-faced unless a specific requirement for sampling closed-faced exists.

For activities that generate a large quantity of dust (i.e., particulates), sample flow rates should be lowered accordingly. For example, sampling pumps for weed trimming or raking should use a flow rate of approximately 3 l/min. Using these sample collection parameters will provide a sensitivity limit of less than or equal to 0.001 structures per cubic centimeter (s/cc).

A meteorological weather station will be used to measure wind speed, wind direction, relative humidity, temperature, and barometric pressure, proximal to the activities. The appropriate distance will be determined on a case-by-case basis, based on site conditions. A meteorologist or other qualified individual should be consulted for guidance. The meteorological station should be of sufficient quality to meet project-specific objectives. The activity-based sampling program is contingent on dry weather. If the weather patterns are not conducive to air sampling, the event will be postponed.

For all activity-based sampling, appropriate personal protective equipment (PPE), including Tyvek® coveralls, booties, protective gloves and foot wear, and a full-face respirator with EPA filter cartridges (P-100 or equivalent), should be worn to protect participants for Level C protection. When possible, a backpack or a belt will be used for carrying personal sampling pumps. They should be constructed of a material that can be easily decontaminated or disposed.

If it is necessary to relieve a participant from the activity, a backup participant will be suited and ready prior to the personnel exchange. The participant will stop the activity, remove the backpack or belt, and pass it to the relief participant similar to the transfer of a baton in a relay race. The original participant will assist the relief participant with donning and adjusting the backpack or belt. The exchange is anticipated to take less than 60 seconds, therefore the sampling pumps and event time clock will not be halted during the exchange. If the exchange requires more than 60 seconds, the pump and event clock will be stopped until activity is re-initiated.

Background or reference samples should be collected for all sampling events. Lot blanks will be submitted and analyzed per ISO 10312 prior to conducting fieldwork.

Participants can be added or subtracted to meet project-specific requirements.

Soil samples will be prepped in accordance with Attachment 4, Analytical Protocol for ACM-Contaminated Soil. Soil asbestos content by EPA/600/R-93/116, soil moisture by ASTM D 2216-90 (Test Method for Laboratory Determination of Water), and grain size by method ASTM D422 (Particle Size) should be measured and recorded in conjunction with the activity-based air sampling.

Sampling will be conducted on up to 4 currently occupied properties in locations where surficial cleanup was not completed in 2006 (see Figures A-1 through A-4. Additionally, at a minimum of two locations adjacent to those above, activity-based sampling will be conducted after ACM is picked up to determine whether ACM pickup minimizes exposure to asbestos fibers released from soil. Activity-based sampling will involve the collection of 0.8-micron pore size filter cassette samples while the following three activities are performed.

Child Playing in the Dirt

This scenario was designed to be representative of a child playing in the dirt with a shovel and pail. Field personnel will don appropriate personal protective equipment (PPE) and sampling pumps while mimicking children digging soil, putting the soil in a bucket, and dumping the soil back on the ground. In this activity or simulation a participant should dig or scrape the top 1 to 2 inches of surface soil, place it in a small bucket or pail and dump it back on the ground. The bucket should be emptied rapidly from a height of approximately 12 inches, based on observations of 2- to 4-year olds playing in a sandbox. The activity will be paced such that soil will be placed in the bucket and dumped every 5 minutes, regardless of the amount of material in the bucket. After repeating this activity three times and completing a set (15 minutes), the individual will turn 90 degrees, and continue the exercise in the same manner to complete another 15-minute set before rotating 90 degrees in the same direction and conducting another set. This approach is designed to mitigate the effect of wind direction on potential exposure. Random head and body movement during the activity should further mitigate the impact of wind direction on exposure. This activity will be repeated for a minimum of 2 hours (8 sets). The subject will be fitted with two personal sample pumps at two distinct flow rates and a personal dust monitor. The inlet to the filter will be at a height of approximately 1 to 3 feet above the ground to simulate a child's actual breathing zone. The meteorological station will be placed upwind within 50 feet of the designated activity area and will log the temperature, barometric pressure, relative humidity, wind direction, and wind speed. The child play activity will be conducted in an area measuring approximately 5 feet by 5 feet. A discrete soil sample will be collected from the surface in the center of this area from a template measuring 8 inches by 8 inches to a depth of 2 inches.

Weed Trimming

This activity is designed to simulate a person trimming weeds and grasses. An electric-powered string trimmer will be operated by personnel wearing appropriate PPE and sampling pumps for a minimum of 2 hours. The operator will wear two personal sampling pumps at distinct flow rates and a personal dust monitor. The actual pump unit will be contained in a backpack with the cassette secured to the shoulder straps near the operator's lapels in the breathing zone, approximately 5 feet above the ground. Trimming will occur in a 45-by-45-foot area with thick vegetation and concentrated levels of ACM. Trimming will occur in a side to side sweeping motion, with the operator moving in a straight line for 10 minutes, resting 5 minutes, and turning 90 degrees to the right before repeating this 15-minute procedure for the duration of the sampling period.

The meteorological station will be placed upwind within 50 feet of the designated activity area and will log the temperature, barometric pressure, relative humidity, wind direction, and wind speed. Prior to conducting this activity, interleaved soil composites will be collected as described under Additional Data Needs below.

Raking (Squares)

In this activity or simulation a participant will rake a lawn or garden area to remove debris such as rocks, leaves, thatch, and weeds. Ideally, raking will be conducted in the same area as weed-trimming following completion of weed trimming to remove debris. Using a steel garden or leaf rake also referred to as a bow rake with a rake width of approximately 15 to 24 inches. Participants should strive to disturb the top 2 inches of soil with an aggressive raking motion. Personnel wearing appropriate PPE and sampling pumps will rake a lawn or garden area to remove debris for a minimum of 2 hours. The operator will wear two personal sampling pumps at distinct flow rates and a personal dust monitor. The actual pump unit will be contained in a backpack with the cassette secured to the shoulder straps near the operator's lapels in the breathing zone, approximately 5 feet above the ground. Raking will occur in a measured area with vegetation, soil or rocks/gravel. Raking will occur in an arched motion raking from the left of the participant to the right. The participants will rake the debris towards themselves facing one side of the square for 15 minutes then the participant will turn 90 degrees clockwise and begin a new side. Participants will continue to rake each side of the square and rotate 90 degrees. Once several small piles of debris have been made, the participant shall pick up the debris and place it in a trash can. The sequence of raking, rotating and picking up debris shall be repeated for the duration of the sampling period. The participant should stay in the same area for the entire sampling period. The raking participants will be fitted with a personal sampling pump contained in a backpack with the cassette secured to the shoulder straps near the operator's lapels in the breathing zone, approximately 5 feet above the ground.

Additional Data Needs

In addition to activity-based sampling, additional sampling will be conducted to better understand the potential exposures and risks posed to residents who are remaining at NRE. The following text describes additional samples to be collected.

- Interleaved-composite soil samples. A composite soil sample will be collected from the Weed Trimming and Raking study area measuring approximately 45 feet by 45 feet. The study area will be subdivided into nine equivalent 15 feet by 15 feet subsections. Within each subsection, a random sample will be collected from an area measuring 8 inches by 8 inches with a 2-inch depth. A second composite sample will be collected over the same study area following this procedure with different random locations sampled within the subsections. The subsection samples will be composited and homogenized for analysis by PLM and TEM (10% presence/absence confirmation).

- Stationary air samples. Stationary pumps will be placed in upwind and downwind locations to characterize ambient conditions, screen out alternate sources of contamination, and determine downwind concentrations. A high volume air sampler will be utilized to collect in excess of 2,500 liters and achieve a detection limit below that of the personal air samplers. One ambient sample will be collected each day of the activity-based sampling as well as the day prior to commencing the activities. The electrical power sources for the high volume samplers may include gasoline-powered generators. To minimize potential interferences, the generators will be located at least twenty-five feet downwind of the air sampler.

Temporal Study Boundaries

In general, asbestos materials are stable substances that do not change chemically or physically over short periods of time. Asbestos fibers become airborne as a result of physical disturbances (or abrasion), which may include wind erosion.

Indoor Sampling at Occupied Residences

Because a major goal of this season's field event is to determine current risks to remaining residents, indoor air and dust samples will be collected to determine exposures and corresponding risks to residents inside their homes. Four types of samples are proposed for collection.

- Indoor Dust – dust samples will be collected to determine whether asbestos fibers originating from ACM outside have migrated indoors (see Attachment 1).
- Personal Indoor Air – air samples will be collected from personal sampling pumps that residents wear while performing routine daily activities within their homes. The purpose of these samples is to measure asbestos exposures that are more typical of day-to-day activities (see Attachment 2).
- Stationary Indoor Air – air samples will be collected from stationary monitors placed within occupied residences to measure typical indoor air concentrations of asbestos. The purpose of these samples is to measure asbestos concentrations in air that could be breathed by residents under routine living conditions. This data also could be used as a backup of personal indoor air samples if pumps failed or if there were other complications with the personal indoor air samples.

In the event a resident does not wish to have indoor air samples collected within their home, then EPA may decide to collect similar data from an unoccupied residence to use as a surrogate for the occupied residence.

Equipment Decontamination

Equipment used to collect or handle soil samples will be decontaminated in accordance with CDM SOP 4-5, Field Equipment Decontamination at Nonradioactive Sites, with modifications. The following modifications to CDM SOP 4-5 have been reviewed and approved:

<u>Section 4.0, Required Equipment</u> - Plastic sheeting will not be used during decontamination procedures. ASTM Type II water will not be used. Rather, locally available distilled water will be used.

<u>Section 5.0, Procedures</u> - Decontamination water will not be captured and will be discharged to the ground where ACM is observed.

Section 5.6, Waste Disposal - Decontamination water will not be captured and will not be packaged, labeled, or stored as investigation-derived waste (IDW).

Decontamination procedures for soil sampling equipment will follow these steps:

- Remove all gross contamination with plastic brush.
- Use distilled water and a plastic brush to wash each piece of equipment.
- Remove excess water present on the equipment by shaking.
- Use a paper towel to dry each piece of equipment.
- Wrap dried equipment in aluminum foil.
- Once a week all soil sampling equipment will be cleaned using Alconox and distilled water.

Design Optimization Sampling

All samples will be collected following applicable SOPs including ERT SOP #2015, ASTM D5755-095, ISO 10312, and others as noted (see Attachment 4).

Sampling Pattern

- On the occupied lots, three activities will be performed at locations designated following a field reconnaissance visit. Each activity will be conducted in each area for a 2-3 hour period. These activities include: mimicking a child digging in the soil; weed trimming; and raking. Personnel will wear two personal monitoring pumps fitted with an appropriate mixed cellulose ester (MCE) filter set at a flow rate of 2 liters/minute and 1.5 liters/minute. The subject will also wear a personal dust monitor at the subject's mid-section (belt). These samples are expected to represent exposure to the asbestos fibers for an individual conducting these activities.
- Activity-based sampling will be conducted in areas that are known to have ACM present in the soils (where applicable). A field reconnaissance will be conducted to identify areas suitable for activity-based sampling prior to the field season.

Numbers of Samples

- A minimum of 2 and a maximum of 4 activity-based air samples will be collected at the site at locations where ACM has been removed prior to sampling and submitted for TEM analysis. A minimum of 9 and a maximum of 16 activity-based air samples will be collected at the site (not including duplicates and/or upwind and downwind samples) and submitted for TEM analysis. The individual conducting the activity will be wearing 2 sample pumps at different flow rates to provide alternative filters for analysis if a filter becomes overloaded with particulate matter. Only 1 of the two filters will be analyzed to represent each activity at each location (excluding any additional filters needed for QA/QC purposes).
- A minimum of 2 and a maximum of 4 indoor personal air samples will be collected at occupied residences.
- A minimum of 4 and a maximum of 9 indoor composite dust samples will be collected at the site.
- A minimum of 8 and a maximum of 21 soil samples will be collected.

Sample Matrix and Target Analytes

- Outdoor activity-based air samples and indoor personal samples will be prepared and analyzed for asbestos content via the ISO 10312 TEM method at the subcontracted commercial laboratory as determined by the RPM.
- Dust samples will be prepared in accordance with ASTM D5755-95 and analyzed for asbestos content via the ISO 10312 TEM method at the subcontracted commercial laboratory as determined by the RPM.
- Soil Samples will be analyzed for asbestos content via EPA/600/R-93/116 at the subcontracted laboratory as determined by the RPM.

See Tables 1 through 4 for sample collection and analysis information. The Sample Plan Alteration Form (Attachment 3) will be used to list project discrepancies (if any) that occurred between planned project activities listed in the final SAP and actual project work.

Sample Packing, Shipping and Documentation

The asbestos samples will be sent under chain of custody (COC) to the laboratory for analysis. Bulk samples will be shipped in a separate container from air samples. Per AHERA regulations, bulk samples and air samples delivered to the analytical laboratory in the same container shall be rejected. FORMS II Lite will be used for sample management and generation of sample labels and COC records. COC records will be used to document the collection of all air samples. All COC records will receive a peer review in the field prior to shipment of the samples in accordance SOPs. At least two custody seals will be placed across the canister shipping containers to ensure sample integrity.

A rigid shipping container such as a cooler will be used. The air filter cassettes will be placed upright in a non-contaminating, non-fibrous medium such as a bubble pack. The use of sealable polyethylene or paper bags may help to prevent jostling of individual cassettes. Expanded polystyrene will not be used to pack samples because of its static charge potential. Also particle-based packaging materials, such as vermiculite, will not be used because of possible contamination.

Cooler/Container Preparation

In preparation for sample shipment:

- Plastic coolers, or similar, will be used for each sample shipment;
- Coolers shall be inspected prior to shipment for cleanliness;
- All cooler drain plugs will be sealed with tape; and
- All previous shipping labels will be removed.

Closing and Shipping of Coolers

Sample documentation will be enclosed in sealed plastic bags taped to the underside of the cooler/container lid. Coolers will be secured with packing tape and custody seals as described below:

- Cooler lids will be taped shut with strapping tape, encircling the cooler several times;
- Chain-of-custody seals will be placed on two sides of the lid after closing the lid (one in front and one on the side); and
- "This Side Up" arrows will be placed on the sides of the cooler.

Hand-carry samples to the laboratory in an upright position if possible; otherwise, choose the mode of transportation least likely to jar the samples in transit, typically overnight shipping. Address the package to the laboratory sample coordinator by name when known and alert him or her of the package description, shipment mode, tracking number and anticipated arrival as part of the chain of custody and sample tracking procedures.

Schedule

The following table shows an approximate schedule for conducting the fieldwork for the RI.

Table 1. Schedule of Tasks

Activity	Estimated Start Date	Estimated Completion Date	Comments
Asbestos Site-Specific QAPP Review/Approval	May 9, 2006	May 16, 2006	
Sample Collection	June 5, 2006	June 23, 2006	
Laboratory Receipt of Samples	June 26, 2006	June 26, 2006	
Laboratory Analysis	June 26, 2006	July 26, 2006	
Data Validation	July 26, 2006	August 10, 2006	
Draft Report	--------------	September 1, 2006	
Target Date Final Report	--------------	October 30, 2006	

Table 2. Sample Information Summary

Project Sampling Schedule[a]	Parameter/ Limits	Design Rationale	Sampling Design Assumptions	Sample Selection Procedures	Measurement Classification (Critical/Non Critical)	Nonstandard Method Validation
Outdoor Activity-Based Personal Air	Asbestos Sensitivity level of 0.001 f/cc	To determine the levels of airborne contaminants generated by performing specific outdoor residential activities at the site.	The residential activities release asbestos fibers to the air.	Samples will be collected from potentially contaminated areas.[b]	Critical	PCM filter utilized.
Soil	Asbestos Sensitivity level of 0.25%	To determine the levels of asbestos in soil in areas where activity-based sampling is performed.	ACM contributes to asbestos contamination in soil.	Samples will be collected in areas with observed ACM.	Critical	na
Indoor Dust	Asbestos Sensitivity level of 200 f/cm^2	To determine the levels of asbestos in indoor dust	Fibers released from ACM/soil have migrated to or have been carried into homes	Samples will be collected from locations where dust may be expected to collect	Critical	na
Indoor Personal Air	Asbestos Sensitivity level of 0.0001 f/cc	To determine the levels of asbestos in breathing zone air to a resident performing routine activities	Fibers released from ACM/soil have migrated to or have been carried into homes	Samples collected for one day are representative of routine personal exposures	Critical	PCM filter utilized

[a] All samples will be collected during the field event. The listed item is the decision area.

[b] As indicated from previous investigations at the site and from on-site observations.

Key:

Critical = Required to achieve project objectives or limits on decision errors

na = not applicable

Table 3. Data Quality Objectives Summary

Analytical Group	Number of Samples	# of QA Samples: Field Dups / Field Blanks / Lot Blanks/ Reference Samples	Matrix	Method	Method Detection Limits	Accuracy	Precision (RPD)	Complete-ness	Volume, Container	Holding Time (days)
Laboratory Measurements										
Asbestos PLM	21	1 SRM 1866a	Soil	EPA/600/R-93/116	1%	Per method	Per method	> 90%	Zip top bag	None
Asbestos TEM	51	2 field blanks per set of samples; 2 lot blank per cassette lot	Air filter	ISO 10312	0.001-0.0001 s/cc	Per method	Per method	> 90%	Cassettes in re-sealable bags	None
Asbestos TEM	9	1 field blank per set of samples; 2 lot blanks per cassette lot	Air Filter (from Microvac)	ISO 10312	200 s/cm^2	Per method	Per method	>90%	Cassettes in re-sealable bags	None

Table 4. QA/QC Analytical Summary and Fixed Laboratory Analytical Methods

Laboratory	Matrix	Parameters/Method	Method Description/ Sensitivity	Total Field Samples[a]	Method Blank	Duplicates	Lot Blanks	Trip Blanks	Total Field and QA/QC Analyses/ Containers[b]	Precision and Accuracy
Commercial Laboratory	Air (Activity-based samples)	TEM Asbestos/ ISO 10312	TEM/ 0.001 fibers/cc	16	na	1	1	na	18	Per ISO Method
Commercial Laboratory	Air (Outdoor Stationary Air samples)	TEM Asbestos/ ISO 10312	TEM/ 0.0001 fibers/cc	32	na	1	1	na	34	Per ISO Method
Commercial Laboratory	Air (Indoor Personal Air samples)	TEM Asbestos/ ISO 10312	TEM/ 0.0001 fibers/cc	2	n	1	1	na	4	Per ISO Method
Commercial Laboratory	Air (Indoor Stationary Air samples)	TEM Asbestos/ ISO 10312	TEM/ 0.0001 fibers/cc	4	na	1	1	na	6	Per ISO Method
Commercial Laboratory	Soil	PLM	1%	21	na	1	na	na	22	
Commercial Laboratory	Soil (confirmation)	TEM	1%	2	na	1	na	na	3	
Commercial Laboratory	Dust	ISO 10312	200 s/cm^2	4-8	na	1	1	na	6-10	
Commercial Laboratory	Soil Moisture	ASTM D 2216-90	Gravimetric/na	4	na	1	na	na	5	
Commercial Laboratory	Grain Size	ASTM D 422	Sieving-Visual/ na	4	na	1	n	Na	5	

[a] Total number of field samples is estimated.

[b] Total analyses and containers includes both field and QA/QC aliquots to be submitted for fixed laboratory analysis.

Key: cc = Cubic centimeter; ISO = International Organization for Standardization; na = not applicable; PLM = Polarized light microscopy; QA = Quality assurance; QC = Quality control; s = structures; TEM = transmission electron microscopy.

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FIGURES

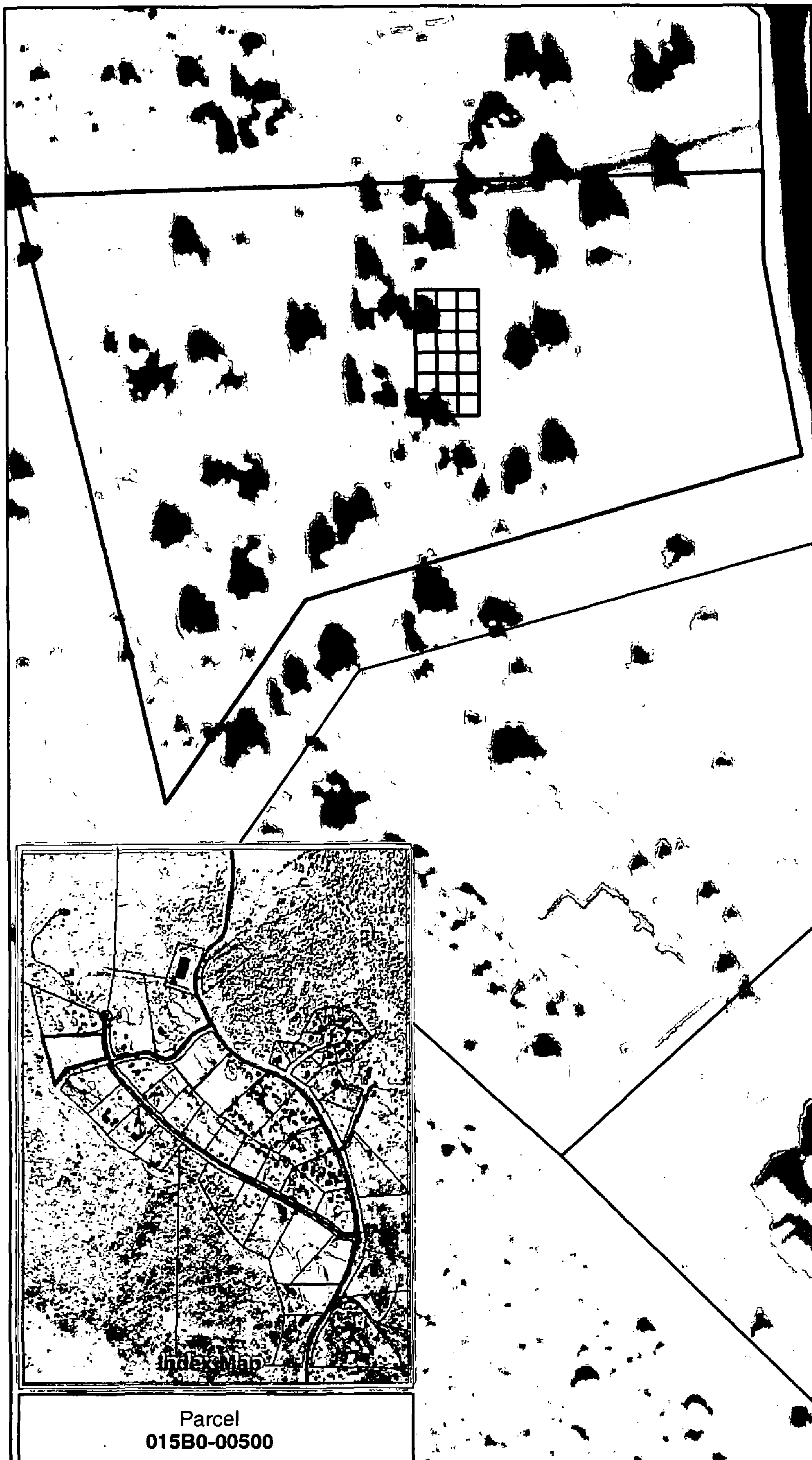


Figure A-1
Activity Based
Sampling Areas

Legend

Parcel 015B0-00500

Activity Based Sampling Areas

Surficial ACM left in place

Surficial ACM removed

N

0 50 100 150
Feet

Geographic Data Standards:
Projected Coordinate System:
NAD 1983 State Plane Oregon South FIPS

Data Source(s):
2001 Aerial Photo

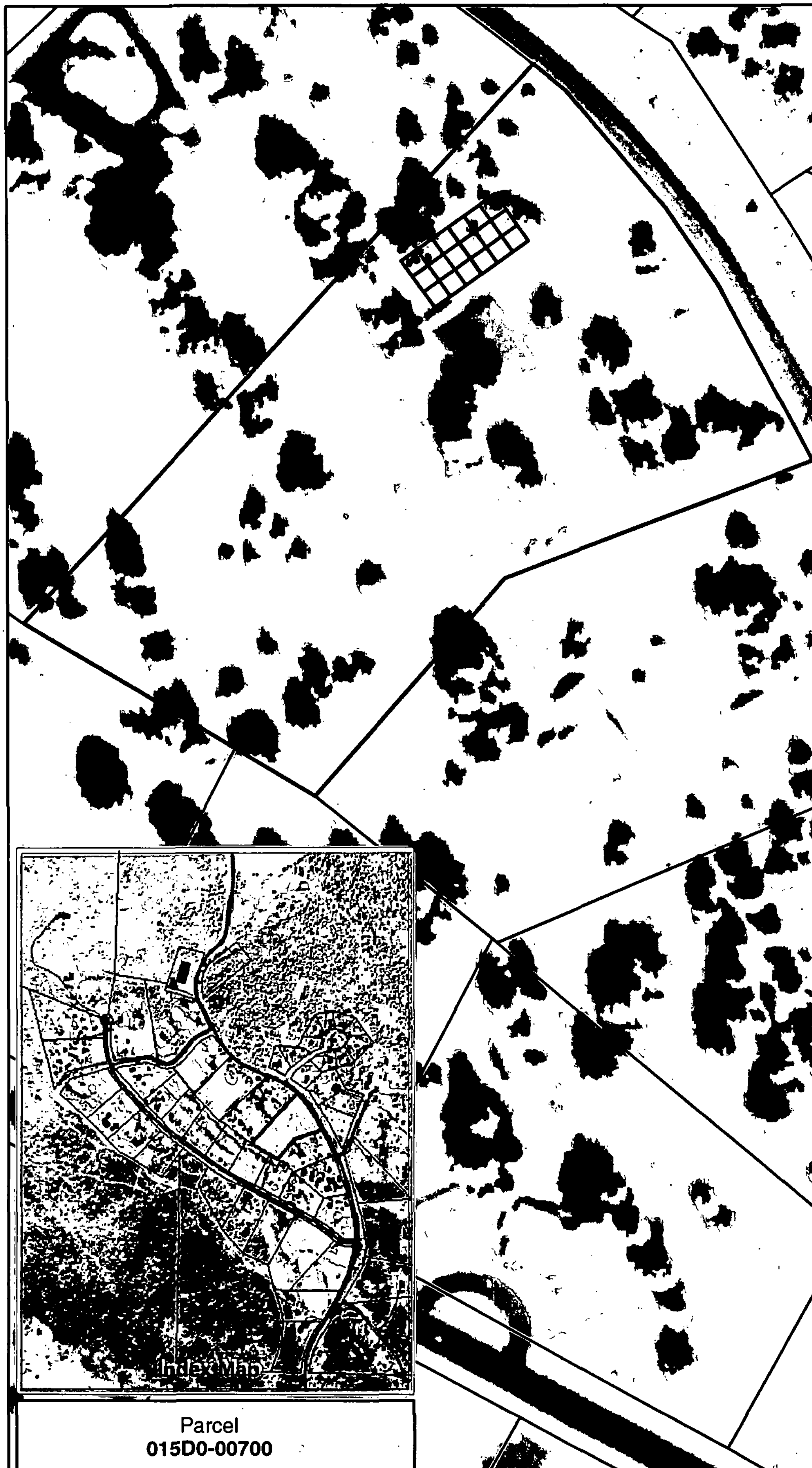
May 2006

This product is for informational purposes and may not have been prepared for legal, engineering or surveying purposes. Users of this information should review or consult the primary data and information source to ascertain the usability of this information.

CDM Parametrix

Analysis by H.Gilbert; Analysis Date: 24-05-2006; Plot Date: 24-05-2006; File Name: FigA-1_ActivityBasedSamplingAreas.mxd

Figure A-2
Activity Based
Sampling Areas



Legend

Parcel 015D0-00700

Activity Based Sampling Areas

Surficial ACM left in place

Surficial ACM removed

N

0 50 100 150
Feet

Geographic Data Standards:
Projected Coordinate System:
NAD 1983 State Plane Oregon South FIPS

Data Source(s):
2001 Aerial Photo

May 2006

This product is for informational purposes and may not have been prepared for legal, engineering or surveying purposes. Users of this information should review or consult the primary data and information source to ascertain the usability of this information.

CDM
Parametrix

Analysis by H.Gilbert; Analysis Date: 24-05-2006; Plot Date: 24-05-2006; File Name: FigA-2_ActivityBasedSamplingAreas.mxd

Figure A-3
Activity Based
Sampling Areas

Legend

Parcel 015D0-01800

Activity Based Sampling Areas

Surficial ACM left in place

Surficial ACM removed

N

0 100 200 300
Feet

Geographic Data Standards:
Projected Coordinate System:
NAD 1983 State Plane Oregon South FIPS

Data Source(s):
2001 Aerial Photo

May 2006

This product is for informational purposes and may not have been prepared for legal, engineering or surveying purposes. Users of this information should review or consult the primary data and information source to ascertain the usability of this information.

CDM
Parametrix

Analysis by H.Gilbert; Analysis Date: 24-05-2006; Plot Date: 24-05-2006; File Name: FigA-3_ActivityBasedSamplingAreas.mxd

Figure A-4
Activity Based
Sampling Areas

Legend

- Parcel 015D0-02900

Activity Based Sampling Areas

- Surficial ACM left in place
- Surficial ACM removed

N

0 50 100
Feet

Geographic Data Standards:
Projected Coordinate System:
NAD 1983 State Plane Oregon South FIPS

Data Source(s):
2001 Aerial Photo

May 2006

This product is for informational purposes and may not have been prepared for legal, engineering or surveying purposes. Users of this information should review or consult the primary data and information source to ascertain the usability of this information.

CDM
Parametrix

Analysis by H.Gilbert; Analysis Date: 24-05-2006; Plot Date: 24-05-2006; File Name: FigA-4_ActivityBasedSamplingAreas.mxd

ATTACHMENT 1

North Ridge Estates Project
Dust Sampling Protocol for Residential Properties
May 2006

1.0 INTRODUCTION

The following protocol will be applied when collecting dust samples at residential properties during the remedial investigation/feasibility study (RI/FS). RI/FS dust samples will be collected from the interior of the main living structure on properties where residents have remained and access to collect samples is granted.

2.0 DUST SAMPLE LOCATIONS

Sample locations will be selected in the field based on where contaminated dust is most likely to be found. The presence of asbestos dust indicated the possibility of past and future exposures. Sampling locations will be selected in the field to collect dust samples based on types of activities associated with the residence of interest specifically focusing on where activities are likely to occur. This approach is necessary to meet the data quality objective (DQO) of determining asbestos concentrations during typical activities in the home. Samples will be collected from high traffic areas and dusty horizontal surfaces. Infrequently cleaned areas may provide an indication of past deposition of asbestos within the residence. Surface dust is defined operationally as that collected by American Society for Testing Materials (ASTM) Method 5755-95 on either smooth or porous services.

The number of samples and sample locations are determined as follows:

- Two dust samples, each collected over three 100 square centimeter (cm^2) areas, will be collected on each level of the living space (i.e., finished basement, ground floor, 2nd floor).
  - One sample will be collected from accessible horizontal surfaces (top of refrigerator, windowsill, shelving, cabinets, etc.).
  - The second sample will be collected from high-traffic walkways and high use areas
- Unfinished basements and attached garages will not be considered part of the living space and will not be sampled.

Dust sample locations for the horizontal surfaces will be selected using the following selection criteria, in order from most to least preferred location:

- Top of refrigerator, shelving, or cabinets
- Under appliances or infrequently moved articles where dust would be expected to accumulate (couches, recliners, entertainment centers, etc.)
- Windowsills

Dust sample locations for the high-traffic walkways and high use areas will be selected using the following selection criteria, in order from most to least preferred location (on the basis of exposure considerations):

- Main entrance, the entrance the residents typically utilize, not necessarily the front door.
- Flooring in the secondary, less heavily used entrance to the residence.
- Flooring in the center of the most frequently used play area for children under the age of six.
- Flooring in an acknowledged or evident route of high traffic flow (stairs, hallway, etc.)

3.0 DUST SAMPLE COLLECTION

The procedure for dust sampling will require collecting dust particulate with a microvacuum from designated areas inside the main living structure on properties. The microvacuum device consists of a battery-operated low volume sampling pump connected to a 25-millimeter (mm) vacuum dust sampler cassette. The cassette is equipped with a 0.45-micron (μm) mixed cellulose ester (MCE) filter.

The sample area will be delineated by using a 100-cm^2 template or a set of rulers. The sample will be collected by activating the pump and passing the nozzle along the surface for 2 minutes in a manner sufficient to vacuum up the settled dust. The details and specific procedure for sample collection are provided in the ASTM Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations – Method D 5755-95 (ASTM 1995), with the following modification:

> Section 8.7, Sampling Area - The ASTM method indicates that a 100 cm^2 sampling area be vacuumed per cassette. In order to obtain a more representative dust sample from within each building, three separate 100-cm^2 sampling areas per sampling cassette will be vacuumed. Therefore, each cassette will represent the dust from a 300 cm^2 area versus a 100 cm^2 area.

Pump calibration will be performed by using a primary standard calibration device (e.g. Dry-Cal) with a 25 mm, 0.45-micron MCE filtered cassette inline before sample collection. The flow-rate of the low-volume sampling pump will be 2 liters per minute (approximate air velocity of 100 [+/-10] centimeters per second based on the flow rate and the 6.35 mm tubing diameter) throughout the sample period.

Detailed notes will be recorded in field logbooks and field sampling data sheets (FSDS) will be completed for each dust sample collected. Sample data and any deviations from this sampling protocol will be recorded in the field logbook. Composite sample location descriptions will be recorded in the field logbook and on the FSDS.

Once the dust sample has been collected and sealed as described in ASTM D 5755-95 (ASTM 1995), a custody seal will be affixed to the cassette. The cassette will be placed into a separate zip-lock baggie. All dust samples will be relinquished to the sample coordinator for shipment to an offsite laboratory. Dust samples will be packaged and shipped in accordance with ASTM D 5755-95.

4.0 QUALITY CONTROL

Lot blanks and field blanks will be collected during this project to ensure that field collection procedures are free of cross-contamination.

LOT BLANKS

Whenever a new lot of filter cassettes are received from the supplier, one cassette from the lot will be selected at random and submitted for analysis to ensure that no asbestos contamination exists on the filters from that lot. Lot blanks will be submitted for analysis as described in Section 5.0. Results from lot blanks will be reported only as fiber loading (structures per millimeter squared, or s/mm^2), since there is no applicable value for the area vacuumed.

No sample shall be collected in cassettes that have not been subject to a lot blank check. All filters in the lot will be rejected if one or more asbestos structures of any type are observed on the lot blank.

FIELD BLANKS

One field blank will be collected at each residential property sampled. Field blanks are prepared by opening the end of a microvacuum cartridge at a sampling location and exposing to air for 5 to 30 seconds. The end is then closed and the sample submitted for analysis and described in Section 5.0. Dust field blanks are used to determine if airborne asbestos is causing detection in the dust samples and/or if cross-contamination is occurring during the sampling process. Like lot blanks, results from field blanks will be reported only as fiber loading (s/mm^2), since there is no applicable value for the area vacuumed.

If one or more asbestos structures is detected on a field blank that result should be promptly communicated to the EPA Remedial Project Manager. The EPA RPM and project staff will evaluate the data, confer with site decision makers as needed, and decide what corrective actions may be required. Specific decisions may vary, depending on the nature of the samples in the sample analytical group and the intended use of the data.

5.0 ANALYSIS

All dust samples will be analyzed by direct transmission electron microscopy (TEM) measurement using ISO Standard 10312:1995(E) (ISO 1995), and if required, TEM by ISO Standard 13794:1999(E). Caution needs to be taken to ensure that the fiber characteristics are retained and that significant breakage of fibers and bundles does not occur during processing of the samples.

6.0 REFERENCES

ASTM. 1995. Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations. Designation D5755-95. October 1995.

International Organization for Standardization. 1995. Ambient Air- Determination of Asbestos Fibers – Direct Transfer Transmission Electron Microscopy Method. ISO 10312:1995(E).

International Organization for Standardization. 1999. Ambient Air- Determination of Asbestos Fibers – Indirect Transfer Transmission Electron Microscopy Method. ISO 137942:1999(E).

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ATTACHMENT 2

North Ridge Estates Project
Indoor Personal Air Sampling Protocol for Residential Properties
May 2006

1.0 INTRODUCTION

The following protocol will be applied when collecting indoor personal air samples on remaining residents during the remedial investigation/feasibility study (RI/FS). RI/FS air samples will be collected under normal living conditions and at residents where access to collect samples is granted.

2.0 PERSONAL AIR SAMPLE COLLECTION

The details and specific procedure for sample collection are provided in the EPA Emergency Response Team (ERT) standard operating procedure (SOP) 2015 – Asbestos Sampling (see Attachment 3).

Air samples will be collected by drawing air through a 25-millimeter (mm) vacuum air cassette with a 0.8-micron (µm) mixed cellulose ester (MCE) filter using a high volume personal air sampling pump, such as an SKC Quick Take. The personal air sampling pump will be worn by an adult resident in the home, who will engage in all normal activities. The participant will need to remain indoors as much as possible throughout the sampling period. During the collection of personal air samples, the resident will complete a residential activity log (Appendix C) that will generally describe the activities they conducted while wearing the sampling pump. Prior to the initiation of sampling activities, the resident will be instructed that during the time of sample collection they should remove and turn the pump off if they leave the property. If the occupant wearing the pump exits the home but remains outdoors on their property, the sampling pump will remain on to include this period of time.

Every 2 to 3 hours each sampling filter will be checked by the sampling technician for visible loading and the flow rate measured. If the loading is too high based on discoloration of the filter, the sample cassette will be replaced and sample collection will continue on a second cassette under a different sample identification number. Both cassettes will be submitted for analysis.

Pump calibration will be performed by using a primary standard calibration device (e.g. Dry-Cal) with a 25 mm, 0.8-micron MCE-filtered cassette inline before sample collection. The flow-rate of the high-volume sampling pump will be 15 liters per minute throughout the sample period of at least 8 hours; for an estimated sample volume of 7,200 liters. This target flow rate and recommended sample duration will ensure a sample volume required for the target analytical sensitivity of 0.0003 structures per cubic centimeter.

Detailed notes will be recorded in field logbooks and field sampling data sheets (FSDS) will be completed for each air sample collected. Sample data and any deviations from this sampling protocol will be recorded in the field logbook.

Once the air sample has been collected and sealed as described in ERT SOP 2015 (1994), a custody seal will be affixed to the cassette. The cassette will be placed into a separate zip top bag. All samples will be relinquished to the sample coordinator for shipment to an offsite laboratory. Samples will be packaged and shipped in accordance with ERT SOP 2015 (1994).

3.0 QUALITY CONTROL

Lot blanks and field blanks will be collected during this project to ensure that field collection procedures are free of cross-contamination.

LOT BLANKS

Whenever a new lot of filter cassettes are received from the supplier, one cassette from the lot will be selected at random and submitted for analysis to ensure that no asbestos contamination exists on the filters from that lot. Lot blanks will be submitted for analysis as described in Section 4.0. Results from lot blanks will be reported only as fiber loading (s/mm^2), since there is no applicable value for volume of air passed through the filter.

No sample shall be collected in cassettes that have not been subject to a lot blank check. All filters in the lot will be rejected if one or more asbestos structures of any type are observed on the lot blank.

FIELD BLANKS

One field blank will be collected at each residential property sampled. Field blanks are prepared by opening the end of the filter cassette at a sampling location and exposing to air for 5-30 seconds. The end is then closed and the sample submitted for analysis as described in Section 4.0. Field blanks are used to determine if airborne asbestos is causing detection in the air samples and/or if cross-contamination is occurring during the sampling process. Like lot blanks, results from field blanks will be reported only as fiber loading (s/mm^2), since there is no applicable value for volume of air passed through the filter.

If one or more asbestos structure is detected on a field blank that result should be promptly communicated to the EPA Remedial Project Manager. The EPA RPM and project staff will evaluate the data, confer with site decision makers as needed, and decide what corrective actions may be required. Specific decisions may vary, depending on the nature of the samples in the sample analytical group and the intended use of the data.

4.0 ANALYSIS

All air samples will be analyzed by direct transmission electron microscopy (TEM) measurement using the International Organization for Standardization (ISO) Standard 10312:1995(E) (ISO 1995), and if required, TEM by ISO Standard 13794:1999(E).

5.0 REFERENCES

EPA Emergency Response Team. 1994. Asbestos Sampling SOP 2015. November 1994.

International Organization for Standardization. 1995. Ambient Air- Determination of Asbestos Fibers – Direct Transfer Transmission Electron Microscopy Method. ISO 10312:1995(E).

International Organization for Standardization. 1999. Ambient Air- Determination of Asbestos Fibers – Indirect Transfer Transmission Electron Microscopy Method. ISO 137942:1999(E).

ATTACHMENT 3

Sample Plan Alteration Form

Sample Plan Alteration Form

Project: Northridge Estates ______________________________

TDD Number: 03-07-0011 ______________________________

Changes from Final SSSP (include rationale, decision area, matrices, parameters, equipment, personnel, etc.):

____

____

____

____

____

APPROVALS

Name	Title	Signature	Date
Alan Goodman	Remedial Project Manager		
Roy Araki	QA Manager		

ATTACHMENT 4

Standard Operating Procedures

APPENDIX B

Screening Level Calculations

1.0 ASBESTOS FIBERS IN AIR: ACTIVITY-BASED SAMPLING ACTIVITIES

1.1 BASIC EQUATIONS

Risk from inhalation exposure to asbestos fibers may be calculated using the cancer risk model currently presented in EPA's Integrated Risk Information System (IRIS). The basic equation is

$$Risk = C * UR * TWF$$

Where:

C = Concentration of fibers in air (f/cc)

UR = Unit Risk (risk per f/cc)

TWF = time-weighting factor (fraction of lifetime during which exposure occurs)

The target screening level can be calculated by revising the equation as follows:

$$SL = TR / (UR * TWF)$$

Where:

TR = Target cancer risk level

1.2 CALCULATION OF SCREENING LEVELS

Each of the three input parameters needed to calculate the target screening level is discussed below, along with the resulting values.

Target Risk Level

The target risk level is a risk management judgment, and may depend on a number of factors. For the purposes of these calculations, the target risk was assumed to be 1E-04 (i.e., one in ten thousand).

Unit Risk

As noted above, the method described in EPA's IRIS is the current, preferred method for estimating cancer risk from asbestos:

> IRIS (2003) identifies a unit risk of 0.23 per phase contrast microscopy (PCM) fiber per cubic centimeter (cc)

Time-Weighting Factor

The TWF is the fraction of full time that exposure occurs. This depends on the assumed time, frequency, and duration of exposure. For the purposes of these calculations, the following assumptions were used:

Activity	Exposure Time (hr/day)	Exposure Frequency (d/year)	Exposure Duration (years)	Total hours	TWF
Total	24	365	70	613200	1.00
Residential RME	24	365	33	289080	0.47
Playing in the Dirt	2	270	10	5400	0.0088
Gardening	10	50	30	15000	0.024

Note that these assumptions may not be identical to those that are used in the actual risk calculations. Rather, these were selected to represent a conservative estimate of the actual exposure associated with each scenario.

Briefly, the values selected for these scenarios were based on the following references:

- **Residential Reasonable Maximum Exposure**: The exposure duration for this scenario is based on the 90th percentile value presented in Table 15-174 of the Exposure Factors Handbook (http://www.epa.gov/ncea/efh/).
- **Playing in the Dirt**: Exposure Factors Handbook, Table 15-58, the 90th percentile value of 120 minutes/day for children ages 1 through 11 was used for the exposure time. Best professional judgment about snow cover at the site was used to arrive at 270 days/year; the entire span of the age group was used for exposure duration.
- **Gardening**: This scenario is based on the 95th percentile value for hours per month that adults garden as provided in the Exposure Factors Handbook, Table 15-62, combined with the standard EPA residential exposure duration.

Results

Based on these inputs, the target screening levels are as follows:

Activity	Screening Level (f/cc)
Living Indoors	0.0009
Playing in the Dirt	0.05
Gardening	0.02

f/cc = fibers per cubic centimeter

2.0 ASBESTOS FIBERS IN DUST: INDOOR MICROVACUUM SAMPLING

2.1 CALCULATION OF A RISK-BASED CONCENTRATION FOR DUST

The calculation of a screening level for dust (SL_{dust}) can be derived from the screening level associated with living indoors as described above (see Section 1.2).

$$SL_{dust}\ (s/cm^2) = 0.0009\ s/cc\ /\ K_{da}$$

Where K_{da} is the transfer factor from dust to air (s/cc per s/cm^2).

Data on the value of K_{da} are limited, but values of about 5E-06 to about 1E-05 s/cc per s/cm^2 seem representative. Therefore, SL_{dust} is about 90 to 180 s/cm^2. The target analytical sensitivity for total asbestos in dust is about 200 s/cm^2, which may correspond to a concentration of about 100 PCM s/cm^2. Thus, it is expected that an analytical sensitivity of 200 s/cm^2 will be sufficient to detect any indoor dust contamination that might be of chronic (i.e., long-term) health concern to residents, and this sensitivity will be more than sufficient to identify any indoor dust levels that are of potential short-term concern. If high levels of asbestos are observed in indoor dust, then EPA will consider remediation alternatives for addressing this potential risk to residents.

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APPENDIX C

Sample Forms

This appendix includes example activity log and sampling forms used for sampling activities at the North Ridge Estates site. The following forms are included:

- Residential Activity Log
- Field Sample Data Sheet for Activity-Based Soil Samples
- Field Sample Data Sheet for Residential Dust Samples
- Field Sample Data Sheet for Activity-Based Stationary Air Samples Field Sample Data Sheet for Activity-Based Personal Air Samples
- Field Sample Data Sheet for Residential Personal Air Samples

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Sheet No.: PA-______

RESIDENTIAL ACTIVITY LOG

Tax Lot ID#: ______________________________

Volunteer Name: ______________________________

Sampling Date(s): ______________________________

Personal air sample number (s): ______________________________

FSDS number(s): ______________________________

Date/Time Interval	Go Outside?	Pump problem?	General Activities
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	

Note: Continue on second page if necessary.

For Field Team Completion (Provide Initials)	Completed by	QC by

Sheet No.: PA-______

NORTH RIDGE ESTATES FIELD SAMPLE DATA SHEET (FSDS) FOR ACTIVITY-BASED SOIL SAMPLES

Field Logbook No: ______________ Page No: ____________ Sampling Date: __________________

Tax Lot ID#: ______________________________

Sampling Team: PMX CDM ERT Other: _________ Names: ______________________________

Data Item	Sample 1	Sample 2	Sample 3
Index ID			
Scenario Activity Type (circle)	Child Play Raking Weed Trimming	Child Play Raking Weed Trimming	Child Play Raking Weed Trimming
Sample Description (circle all that apply)	ACM On Surface ACM In Sample ACM Not Observed	ACM On Surface ACM In Sample ACM Not Observed	ACM On Surface ACM In Sample ACM Not Observed
Category (circle)	FS FD of ________ Field Blank	FS FD of ________ Field Blank	FS FD of ________ Field Blank
Matrix Type (circle)	Surface Soil Other ______________	Surface Soil Other ______________	Surface Soil Other ______________
Type (circle)	Grab Comp. # subsamples _____	Grab Comp. # subsamples _____	Grab Comp. # subsamples _____
Sample Time			
Top Depth (in.)			
Bottom Depth (in.)			
GPS Points Collected? (Provide File Name)	File Name:	File Name:	File Name:
Field Comments	Type of ACM Observed (circle all that apply): VAT, CAB, AirCell, MAG, Roofing Material	Type of ACM Observed (circle all that apply): VAT, CAB, Air Cell, Mag, Roofing Material	Type of ACM Observed (circle all that apply): VAT, CAB, Air Cell, Mag, Roofing Material
Sample Entry into Forms II Lite Completed	Provide Initials of Personnel Completing Entry into Forms II Lite: _______	Provide Initials of Personnel Completing Entry into Forms II Lite: _______	Provide Initials of Personnel Completing Entry into Forms II Lite: _______

For Field Team Completion (Provide Initials)	Completed by	QC by

Sheet No.: PA(R)-______

NORTH RIDGE ESTATES FIELD SAMPLE DATA SHEET (FSDS) FOR RESIDENTIAL DUST SAMPLES

Field Logbook No: ______________ Page No: ____________ Sampling Date: __________________

Tax Lot ID#: ______________________________ Owner/Tenant: ___________________________

Sampling Team: PMX CDM ERT Other: _________ Names: _________________________________

Data Item	Cassette 1			Cassette 2			Cassette 3		
Index ID									
Location Description (circle) (Detailed description point within the location)	Basement, Ground Floor, Second Level Other_______________			Basement, Ground Floor, Second Level Other_______________			Basement, Ground Floor, Second Level Other_______________		
Matrix Type (circle)	Horizontal Surfaces High Traffic Areas Other_______________			Horizontal Surfaces High Traffic Areas Other_______________			Horizontal Surfaces High Traffic Areas Other_______________		
Category (circle)	FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)		
Sample Area (cm^2) (circle)	100 200 300 NA			100 200 300 NA			100 200 300 NA		
Filter Diameter (circle)	25mm 37mm			25mm 37mm			25mm 37mm		
Pore Size (circle)	TEM- .45 PCM- 0.8			TEM- .45 PCM- 0.8			TEM- .45 PCM- 0.8		
Flow Meter Type (circle)	Rotometer Dry-Cal NA			Rotometer Dry-Cal NA			Rotometer Dry-Cal NA		
Pump ID No.									
Flow Meter ID No.									
Start Time									
Start Flow (L/min)									
Stop Time									
Stop Flow (L/min)									
Pump Fault? (circle)	No Yes			No Yes			No Yes		
Field Comments Cassette Lot Number: __________	100 cm^2 100 cm^2 100 cm^2			100 cm^2 100 cm^2 100 cm^2			100 cm^2 100 cm^2 100 cm^2		
Sample Entry Into Forms II Lite Completed	Provide Initials of Personnel Completing Entry Into Forms II Lite:_________			Provide Initials of Personnel Completing Entry Into Forms II Lite:_________			Provide Initials of Personnel Completing Entry Into Forms II Lite:_________		

For Field Team Completion (Provide Initials)	Completed by	QC by

Sheet No.: PA(R)-______

NORTH RIDGE ESTATES FIELD SAMPLE DATA SHEET (FSDS) FOR ACTIVITY-BASED STATIONARY AIR SAMPLES

Field Logbook No: ______________ Page No: ______________ Sampling Date: ____________________
Tax Lot ID#: ____________________________________
Sampling Team: PMX CDM ERT Other ________ Names: ______________________________________

Data Item	Cassette 1			Cassette 2			Cassette 3		
Index ID									
Scenario Activity Type (circle)	NA Child Play Raking Weed Trimming			NA Child Play Raking Weed Trimming			NA Child Play Raking Weed Trimming		
Location Description (circle)	Upwind Downwind Indoors:______________			Upwind Downwind Indoors:______________			Upwind Downwind Indoors:______________		
Category (circle)	FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)		
Filter Diameter (circle)	25mm 37mm			25mm 37mm			25mm 37mm		
Pore Size (circle)	TEM- 0.45 PCM- 0.8			TEM- 0.45 PCM- 0.8			TEM- 0.45 PCM- 0.8		
Flow Meter Type (circle)	Rotometer DryCal NA			Rotometer DryCal NA			Rotometer DryCal NA		
Pump ID Number									
Flow Meter ID No.									
Start Date									
Start Time									
Start Flow (L/min)									
Stop Date									
Stop Time									
Stop Flow (L/min)									
Pump fault? (circle)	No Yes NA			No Yes NA			No Yes NA		
MET Station onsite?	No Yes NA			No Yes NA			No Yes NA		
GPS Points Collected? Not Applicable for indoor samples	File Name:			File Name:			File Name:		
Field Comments Cassette Lot Number: __________									
Sample Entry Into Forms II Lite Completed	Provided Initials of Personnel Completing Entry Into Forms II Lite:________			Provided Initials of Personnel Completing Entry Into Forms II Lite:________			Provided Initials of Personnel Completing Entry Into Forms II Lite:________		

For Field Team Completion (Provide Initials)	Completed by	QC by

Sheet No.: PA(R)-______

NORTH RIDGE ESTATES SAMPLE DATA SHEET (FSDS) FOR ACTIVITY-BASED PERSONAL AIR SAMPLES

Field Logbook No: ______________ Page No: ______________ Sampling Date: ____________________

Tax Lot ID#: ___________________________________

Scenario Activity: Child Play Raking Weed Trimming

Sampling Team: PMX CDM ERT Other ________ Names: _____________________________________

Person Sampled: ____________________ SNN (last 4 digits):_________

Data Item	Cassette 1			Cassette 2			Cassette 3		
Index ID									
Category (circle)	FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)		
Filter Diameter (circle)	25mm 37mm			25mm 37mm			25mm 37mm		
Pore Size (circle)	TEM- 0.45 PCM- 0.8			TEM- 0.45 PCM- 0.8			TEM- 0.45 PCM- 0.8		
Flow Meter Type (circle)	Rotometer DryCal NA			Rotometer DryCal NA			Rotometer DryCal NA		
Pump ID Number									
Flow Meter ID No.									
Start Date									
Start Time									
Start Flow (L/min)									
Stop Date									
Stop Time									
Stop Flow (L/min)									
Pump fault? (circle)	No Yes NA			No Yes NA			No Yes NA		
MET Station onsite?	No Yes NA			No Yes NA			No Yes NA		
Sample Type	TWA EXC NA			TWA EXC NA			TWA EXC NA		
Field Comments Cassette Lot Number: ___________	Archive Blank (circle): Yes No								
Sample Entry Into Forms II Lite Completed	Provide Initials of Personnel Completing Entry Into Forms II Lite:_________			Provide Initials of Personnel Completing Entry Into Forms II Lite:_________			Provide Initials of Personnel Completing Entry Into Forms II Lite:_________		

For Field Team Completion (Provide Initials)	Completed by	QC by

Sheet No.: PA(R)-______

NORTH RIDGE ESTATES FIELD SAMPLE DATA SHEET (FSDS) FOR RESIDENTIAL PERSONAL AIR SAMPLES

Field Logbook No: ____________ Page No: ___________ Sampling Date: _______________
Tax Lot ID#: ____________________________ Owner/Tenant: ______________________
Sampling Team: PMX CDM ERT Other ________ Names: ______________________________
Person Sampled: _____________________ Task: Routine House Hold Activities

Data Item	Cassette 1			Cassette 2			Cassette 3		
Index ID									
Category (circle)	FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)			FS FB-(field blank) LB-(lot blank)		
Filter Diameter (circle)	25mm 37mm			25mm 37mm			25mm 37mm		
Pore Size (circle)	TEM- 0.45 PCM- 0.8			TEM-0.45 PCM- 0.8			TEM- 0.45 PCM- 0.8		
Flow Meter Type (circle)	Rotometer DryCal NA			Rotometer DryCal NA			Rotometer DryCal NA		
Pump ID Number									
Flow Meter ID No.									
Start Date									
Start Time									
Start Flow (L/min)									
Stop Date									
Stop Time									
Stop Flow (L/min)									
Pump fault? (circle)	No Yes NA			No Yes NA			No Yes NA		
MET Station onsite?	No Yes NA			No Yes NA			No Yes NA		
Sample Type	TWA EXC NA			TWA EXC NA			TWA EXC NA		
Field Comments Cassette Lot Number: __________	Archive Blank (circle): Yes No								
Sample Entry Into Forms II Lite Completed	Provide Initials of Personnel Completing Entry Into Forms II Lite:________			Volpe: Entered _____ Validated _____			Volpe: Entered _____ Validated _____		

For Field Team Completion (Provide Initials)	Completed by	QC by

Final Project Health and Safety Plan
North Ridge Estates
Klamath Falls, Oregon

Prepared for

U.S. Environmental Protection Agency
Oregon Operations Office
811 SW 6th Avenue, 3rd Floor
Portland, OR 97204

Prepared by

Parametrix
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www.parametrix.com

June 2006 | 415-2328-007 030*FI10

CITATION

Parametrix. 2006. Final Project Health and Safety Plan
North Ridge Estates, Klamath Falls, Oregon.
Prepared by Parametrix, Portland, Oregon. June 2006.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

E-Signed by PAMELA PHILIP for Dee Waren

Prepared by Dee Warren
CDM Site Manager

Brad Hermanson

Checked by Brad Hermanson
Parametrix Project Manager

E-Signed by PAMELA PHILIP for Jeff Montera

Checked by Jeff Montera
CDM Project Manager

Checked by Chuck Myers, CIH
CDM Corporate Health and Safety Director

for Sheila McConnell

Approved by Sheila McConnell, CIH
Parametrix Corporate Health and Safety Officer

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APPENDICES

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ACRONYMS

ACM	asbestos containing material
APR	air purifying respirator
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
EPA	United States Environmental Protection Agency
f/cc	fibers per cubic centimeter
GPS	Global Positioning System
HASP	Project Health and Safety Plan
HAZWOPER	Hazardous Waste Operation
IDW	investigation derived waste
mg/kg	milligrams per kilogram
MSDS	material safety data sheets
NIOSH	National Institute for Occupational Safety and Health
NRE	North Ridge Estates
OSHA	Occupational Safety and Health Administration
PCM	phase contrast microscopy
PEL	permissible exposure limit
PID	photoionization detector
PLM	polarized light microscopy
PPE	personal protective equipment
RI/FS	remedial investigation/feasibility study
S/cc	structures per cubic centimeter
SOP	Standard Operating Procedure
TLV	threshold limit value

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PROJECT HEALTH AND SAFETY INFORMATION SHEET

Project Managers: Brad Hermanson, Parametrix (Parametrix); Jeff Montera, CDM
Date: May 9, 2006

Project Name: North Ridge Estates, Remedial Investigation/Feasibility Study (RI/FS)
Project No.: 415-2328-801; Task Order No. 030

Site Name and Address: Old Fort Road, Thicket Court, and North Ridge Drive in Klamath Falls, Klamath County, Oregon

Client Contact: Alan Goodman, EPA Region 10 TOPO
Phone: (503) 326-3685

Site Description: The NRE Site is a residential development built on top of asbestos-containing material (ACM) from the demolition of a U.S. Marines recuperation barracks facility built in the 1940's.

Estimated Date of Fieldwork: June 15 – June 30, 2006
Due Date of Health & Safety Plan: June 5, 2006

Type of Work to be Performed (*check all that apply*):

☐ File Review ☐ Surveying ☒ Environmental Sampling ☐ Engineering and/or Maintenance work (specify below) ☒ Inspection

Notes: Bulk soil samples will be collected to determine remedial boundaries and test pits will be excavated to determine the volume of material present in burial piles and large land units.

Collection of Field Samples:

☐ Groundwater ☐ Surface Water ☒ Soil ☒ Air ☐ Wastes (specify)

☐ Biological ☐ Entry into confined spaces (e.g., storage tank, sewer, utility vault, trenches, or other excavations) ☐ Other (please specify)

Notes: Asbestos in the form of asbestos containing materials (ACM) and free asbestos fibers in soil, air, and indoor dust is the main contaminate of concern. Other contaminants of concern potential concern include volatile organic compounds, semi-volatile organic compounds, total petroleum hydrocarbons, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, pesticides, insecticides, herbicides, and metals. High levels of noise and safety hazards may be present from sampling equipment (i.e. Geo Probe and mini excavator).

Role of Parametrix at site *(check one)*:

☒ Prime Contractor ☐ Subcontractor to:

Notes: Parametrix personnel will be performing site investigation activities in concert with the environmental subcontractor.

☐ Drilling ☐ Operations and Maintenance ☐ Construction ☒ Field Sampling

☐ Surveying ☐ Remedial Actions

Field Team Leaders:
Site Manager: Dee Warren – CDM
Asbestos Investigation Team Leader – Nicole Bielecki – CDM
Non-Asbestos Investigation Team Leader – John Howland – Parametrix

Project Health and Safety Officer: Sheila McConnell

Regulatory/Enforcement Status of Site *(check all that apply)*:

☐ Superfund Site

☒ Enforcement Actions *(please check all that apply and describe)*

- ☒ Federal – EPA
- ☒ State
- ☐ Local

☐ Voluntary Investigations by Site Owner

☐ On-site inspectors present? *(If yes, provide names, phone numbers, and agency affiliations.)*

Notes: EPA Region 10

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1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Region 10 has requested Parametrix (Contractor) to provide remedial investigation and feasibility services for the North Ridge Estates (NRE) site, located approximately 3 miles north of Klamath Falls, in Klamath County, Oregon. Specific elements for this project are presented in EPA's Statement of Work Request transmitted to Parametrix dated September 14, 2005. The goals of this project are to determine the remedial requirements for the NRE site related to the presence of asbestos and to determine the presence or absence of other contaminants of concern (COCs) and remedial requirements related to their presence. These goals will be achieved by conducting the following field activities, which are further detailed in the site sampling and analysis plans:

- Bulk soil sampling
- Subsurface soil sampling
- Surface soil sampling
- Excavation of test pits

This Project Health and Safety Plan (HASP) presents project-specific health and safety requirements for environmental sampling and investigations to be conducted at the NRE site. This HASP is designed for use in conjunction with the Parametrix Health and Safety Manual (Parametrix 2003).

The health and safety requirements presented in this document are applicable to Parametrix employees and Parametrix subcontractors working on the project and to persons visiting the job site during sampling activities. Any modification or additions to this project HASP will be completed as addenda in the form of technical memoranda.

1.1 SCOPE OF WORK

The proposed activities to be conducted during the remedial investigation/feasibility study activities include:

- Bulk soil sampling for asbestos.
- Collection of surface soil samples for non-asbestos containing material (non-ACM).
- Collection of subsurface soil samples for non-ACM.
- Excavation of test pits in areas where ACM exists.
- Surface visual inspections.
- Collection of burial pile dimension measurements.
- Trenching or direct push probing using a Geoprobe® direct push machine or similar equipment in suspect disposal areas.
- Surveying sampling locations and the locations of other site features using the Global Positioning System (GPS).

The overall hazard level associated with the above activities is expected to be moderate. An analysis of potential hazards associated with these sampling activities is presented in Section 2.

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2. HAZARD ANALYSIS

A hazard analysis was conducted for the NRE field activities to identify potential health and safety concerns. The results of the hazard analysis for the proposed site activities are presented in Table 2 1. The hazard analysis will be updated if additional project-related hazards are identified during remedial action.

Previous investigations conducted at the project site by PBS (2003, 2004) and Ecology and Environment 2003, 2004, 2005) have identified asbestos as the primary contaminant of concern (COC) (PBS 2004; E&E 2005). Maximum concentrations of asbestos observed in on-site media are shown in Table 2-2.

Table 2-1. Hazard Analysis for Project Activities

Activity	Hazard	Mitigation
Bulk Soil Sampling for Asbestos Surface Soil Sampling for Non-ACM	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Flying Debris	• Wear safety glasses or other applicable eye protection.
	Asbestos and/or Chemicals	• Wear proper personal protective equipment (PPE) (Level C with HEPA filters and OV as needed). • Collect personal samples when handling soils. • Wash hands thoroughly after handling soils. • Conduct air monitoring as needed for organic vapors, asbestos, etc. • Be familiar with potential chemicals of concern at job site, primarily asbestos.
	Underground Utilities	• Ensure clearance before any intrusive work.
	Lifting	• Use proper lifting equipment and techniques when moving equipment, tools, drums, etc.
	Steep Slopes	• Use two-person sampling teams when sampling on or around steep slopes. • Keep equipment away from the edge of the slope.
Surface Soil Sampling for Non-ACM	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Flying Debris	• Wear safety glass or other applicable eye protection.
	Asbestos and/or Chemicals	• Wear proper personal protective equipment (PPE) (Level C with HEPA filters and OV as needed). • Collect personal samples when handling soils. • Wash hands thoroughly after handling soils. • Conduct air monitoring as needed for organic vapors, asbestos, etc. • Be familiar with potential chemicals of concern at job site, primarily asbestos.

Activity	Hazard	Mitigation
	Lifting	• Use proper lifting equipment and techniques when moving equipment, tools, drums, etc.
	Steep Slopes	• Use two-person sampling teams when sampling on or around steep slopes. • Keep equipment away from the edge of the slope.
Collection of Subsurface Soil Samples for Non-ACM	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Flying Debris	• Wear safety glass or other applicable eye protection.
	Asbestos and/or Chemicals	• Wear proper personal protective equipment (PPE) (Level C with HEPA filters and OV as needed). • Collect personal samples when handling soils. • Wash hands thoroughly after handling soils. • Conduct air monitoring as needed for organic vapors, asbestos, etc. • Be familiar with potential chemicals of concern at job site, primarily asbestos.
	Underground Utilities	• Ensure clearance before any intrusive work.
	Lifting	• Use proper lifting equipment and techniques when moving equipment, tools, drums, etc.
	Steep Slopes	• Use two-person sampling teams when sampling on or around steep slopes. • Keep equipment away from the edge of the slope.
	Underground Utilities	• Ensure clearance before any intrusive work.
	Overhead	• Wear hardhat (if a GeoProbe® is used for sample collection).
	Noise	• Wear hearing protection (if a GeoProbe® is used for sample collection).
Excavation of Test Pits	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Mechanical	• Proper operation of mechanical devices. • Be familiar with operation. • Gain eye contact with equipment operator before entering work area. • Operator should look before backing.
	Flying Debris	• Wear safety glasses or other applicable eye protection.
	Asbestos and/or Chemicals	• Wear proper personal protective equipment (PPE) (Level C with HEPA filters and OV as needed). • Collect personal samples when handling soils. • Wash hands thoroughly after handling soils. • Conduct air monitoring as needed for organic vapors, asbestos, etc. • Be familiar with potential chemicals of concern at job site, primarily asbestos.

Activity	Hazard	Mitigation
	Underground Utilities	• Ensure clearance before any intrusive work.
	Overhead	• Wear hardhat.
	Noise	• Wear hearing protection, as needed, especially in areas where it is difficult to carry on normal conversation.
	Lifting	• Use proper lifting equipment and techniques when moving equipment, tools, drums, etc.
	Trenches	• Do not enter trenches. • All samples should be collected from excavator's bucket. • All observations should be made from a safe location at the side of the trench. • Keep visible to the operator if heavy equipment is being used.
Surface Visual Inspections	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Steep Slopes	• Use two-person sampling teams when sampling on or around steep slopes. • Keep equipment away from the edge of the slope.
Collection of Burial Pile Dimensions	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Steep Slopes	• Use two-person sampling teams when sampling on or around steep slopes. • Keep equipment away from the edge of the slope.
Surveying Sampling Locations and Site Features Using GPS	Slips/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Steep Slopes	• Use two-person sampling teams when sampling on or around steep slopes. • Keep equipment away from the edge of the slope.
General Site Safety Concerns	Vehicle Traffic	• Always wear traffic vests (closed completely) when working outdoors. • Drive the posted speed limit on developed roads. • Do not exceed 15 miles per hour on undeveloped roads/areas. • Do not talk on a cell phone or radio while operating a vehicle or heavy equipment.
	Heat Stress	• Plan activities and timing for the weather. • Take frequent breaks in the shade. • Drink plenty of water. • Wear sunscreen and reapply as necessary.

Activity	Hazard	Mitigation
	Wildlife	• Make noise and walk with heavy steps to be heard and felt. • The western diamondback rattle snake is known to exist at the site. Avoid all snakes. If a snake is encountered, back away slowly. Do not reach into areas that you cannot easily see, and use caution when turning over rocks, boards, etc. • Mountain lions and bobcats are known to exist in the area of the site. If a mountain lion or bobcat is encountered: do not run, stay calm, hold your ground, face the lion/cat and stand upright, do all you can to appear larger, grab a stick, raise your arms. If the lion behaves aggressively, wave your arms, shout and throw objects at it. If attacked, fight back.
	Earthquakes	• If indoors – drop to the ground and take cover by getting under a sturdy table or other piece of furniture. If there isn't a table or desk near by, cover your face and head with your arms and crouch in an inside corner of the building. Stay away for glass, windows, and outside door and walls. • If in a moving vehicle – stop as quickly as safety permits. Avoid stopping near or under buildings, overpasses, utility wires, and large trees. • If outdoors – stay there. Move away from buildings, streetlights, overhead utilities, and large trees.

Table 2-2. Maximum Concentrations of Asbestos Observed at NRE

Media	Asbestos Type	Asbestos Concentration
Cement Asbestos Board	Chrysotile	25%
Vinyl Asbestos Floor Tile	Chrysotile	10%
Roofing Material	Chrysotile	40%
AirCell as Steam Pipe Insulation	Chrysotile	40%
MAG as Steam Pipe Insulation	Chrysotile	25%
	Amosite	55%
Surface Soil	Chrysotile	0.21%
	Amosite	0.05%
Outdoor Air	Chrysotile	1.0E-03 S/cc*
	Actinolite	1.0E-03 S/cc*
Indoor Air	Chrysotile	1.0E-04 S/cc*
	Amosite	1.0E-04 S/cc*

Notes: % - percent; S/cc – structures per cubic centimeter; * - Concentrations are equal to the analytical sensitivity

Investigations related to the presence of lead and polychlorinated biphenyls have also been conducted at the site. Table 2-3 summarizes the maximum observed concentrations of these other contaminates of potential concern.

Table 2-3. Maximum Concentrations of Other Contaminants of Potential Concern

Media	Lead (mg/kg)	PCBs (mg/kg)
Surface Soil	93	>50

Notes: mg/kg = milligrams per kilogram

Precautions will be taken by all persons conducting remedial activities at the site to minimize exposure to potential chemicals of concern. Information on reducing contact with potential chemicals of concern is presented in the following sections.

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3. AIR MONITORING

Sampling and investigation activities will be conducted in open, well ventilated areas; however, due to the friable nature of the ACM present at the site and the possible presence of free asbestos fibers in surface and subsurface soils, Level C PPE (including a full face air purifying respirator [APR] with HEPA/OV filtration) will be required for all intrusive activities.

Air monitoring will include the collection of both excursion and 8-hour samples for asbestos. As long as there has been no clearance established, respirators and PPE will be used. The asbestos samples will be analyzed via phase contrast microcopy (PCM) according to the method described in the National Institute of Occupational Safety and Health (NIOSH) Method 7400, Issue 2. Exposure limits are shown in Table 3-1. Only those employees working in direct contact with contaminants will be monitored for potential exposure. If any conditions or monitoring shows those employees having potential exposure, the monitoring plan will be re-evaluated, and other employees may be added for monitoring. The Project Health and Safety Manager and Project Manager will be notified with questions or adjustments to air monitoring procedures.

All air monitoring and instrumentation calibration data will be recorded in daily field logs. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

Table 3-1. Exposure Concentrations

Analyte	TLV/PEL	EPA Clearance
Asbestos	**TWA** 0.1 f/cc **Excursion** 1.0 f/cc	0.01 f/cc
Lead	**TWA** 0.050 mg/m^3	

Source: NIOSH Pocket Guide to Chemical Hazards for Asbestos (www.cdc.gov/niosh), Appendices A and C.

For asbestos: OSHA 29 CFR 1910.1001; for lead OSHA 29 CFR 1910.1025.

Notes: f/cc = fibers per cubic centimeter
mg/m^3 = milligrams per cubic meter
PEL = Permissible Exposure Limit
TLV = Threshold Limit Value
TWA = Time Weighted Average
NA = not applicable

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4. PERSONAL PROTECTIVE EQUIPMENT

Based on available chemical information for the project sites, Level C or D PPE will be required.

Level D

Level D PPE will be required while conducting the following activities:

- Surface visual inspections.
- Collection of burial pile dimension measurements.
- Surveying sampling locations using GPS.

This level of protection generally includes:

- Steel-toe/shank leather or rubber boots.
- Nitrile surgical weight gloves to be used as inner gloves.
- Work gloves, nitrile gloves, or equivalent, to use as outer gloves, as needed.
- Hardhat (if overhead hazards are present).
- Safety glasses or goggles for general site work.
- Hearing protection for all activities in areas where it is necessary to shout to communicate, or as decided.

Level C

Level C PPE will be required while conducting the following activities:

- Bulk soil sampling for asbestos.
- Collection of surface soil samples for non-ACM.
- Collection of subsurface soil samples for non-ACM.
- Direct push probing using a Geoprobe® direct push machine or similar equipment, and excavation of test pits.

This level of protection generally includes:

- Full face air-purifying respirator with a P100 filter.
- Steel-toe/shank leather or rubber boots.
- Tyvek® suit, or equivalent, as needed for working with contaminated soil.
- Nitrile surgical weight gloves to be used as inner gloves.
- Work gloves, nitrile gloves, or equivalent, to use as outer gloves, as needed.
- Hardhat (if overhead hazards are present).
- Safety glasses or goggles for general site work.
- Hearing protection for all activities in areas where it is necessary to shout to communicate, or as decided.

Additional information on PPE is presented the *Parametrix Health and Safety Manual* (Parametrix 2003), Standard Operating Procedure HS-002, and Section 9 of this document.

A copy of this HASP, a first aid kit and a fire extinguisher will be available in each vehicle used during sampling activities.

5. SITE CONTROL AND DECONTAMINATION

Work site controls will be established whenever soil disturbance may take place. Inspections and other similar activities do not need hazardous waste site controls; however, there may be other crews with site zones established, and these shall be respected and maintained.

The object of site control is to assure that only qualified personnel enter potentially hazardous locations and to effectively control the spread of contamination. As a minimum, a "hot" zone extending approximately 10 feet from the work should be established. If the sampling personnel are reasonably certain that untrained, unprotected people will not enter the "hot" zone, then demarcation may not be necessary.

The following items should be remembered when establishing site control:

- Site control measures shall be established prior to beginning any work that potentially disturbs contaminants soils or sediments.
- Personnel will not get into vehicles with dirty boots, boot covers, or in dirty coveralls. Set the job up to keep the soils in their original location on the site.
- The work area shall be protected from public intrusion.
- It is up to each sampling crew to establish site control based on potential hazards and on the crew's planned activities. Make it practical and useful.

Any potentially contaminated personnel will decontaminate prior to getting into vehicles, eating lunch, entering the site trailer, or leaving the site.

For all personnel working within a "hot" zone, decontamination will be conducted to remove gross contamination that may have accumulated on workers, equipment, and sampling supplies during site activities and to prevent the migration of contaminants from the site. Decontamination may consist of brushing with a stiff brush to remove dry particles and, if necessary, washing with clean water and rinsing with clean water. As long as asbestos may be present, wet methods shall be used. Additional information on decontamination procedures can be found in the *Parametrix Health and Safety Manual* (Parametrix 2003), Standard Operating Procedure HS-007, and Section 9 of this document.

Clean water for decontamination will be available at the garage/command post. After decontamination, used water will not be collected; instead, it will be allowed to collect on the ground. Additional information related to waste handling is described in the *Parametrix Health and Safety Manual* (Parametrix 2003), Standard Operating Procedure HS-006, and Section 9 of this document.

Both ACM and non-ACM PPE and ACM investigation derived waste (IDW) used at this site will be double-bagged in clear plastic bags, visibly wetted, and closed by placing tape around the top to securely close the opening. (Non-ACM IDW handling is described in Appendix D.) Each bag will be labeled "IDW." Before IDW can be disposed of at a municipal landfill, a sample will be collected and submitted for analysis via polarized light microscopy (PLM) using NIOSH Method 9002 Issue 2 to determine if the asbestos content is below 1 percent. PPE and IDW will be placed in a dumpster separate from regular trash between use and final disposal at the county landfill.

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6. TRAINING AND SAFETY AUDITS

All personnel conducting sampling activities on the project site must be 40 hour Hazardous Waste Operation (HAZWOPER) trained per 29 Code of Federal Regulations (CFR) 1910.120 and must be current with their annual 8 hour refresher course. All personnel should have proof of currency with HAZWOPER training requirements available on the project site.

All personnel working at this project site must also complete training to become familiar with the hazards associated with asbestos and training related to the wearing of respiratory protection (as required by 29 CFR 1910.134). All personnel should have proof of these training requirements available on the project site. The course that will be used to train site personnel on the hazards of asbestos is a course that is used to meet the requirement of 29 CFR 1910.1001 (Asbestos – General Industry). While the work to be conducted at the site does not require this training course, it will be used at this site for personnel to gain knowledge of the hazards of working with asbestos and how to protect themselves from exposures.

All personnel working at the project site will be briefed on potential site hazards, health and safety procedures, site construction rules and requirements, and sampling procedures. Following completion of this training, all personnel will be required to sign an acknowledgement form verifying that they have completed the project-specific health and safety training. A copy of the Project-Specific Training Acknowledgement Form is included in Appendix A.

A tailgate safety meeting will be conducted each morning prior to the start of daily field activities. Each Parametrix employee and, as appropriate, subcontractor personnel will attend the tailgate safety meeting and sign the daily tailgate meeting log. A Daily Tailgate Meeting Log is included in Appendix A.

A job site inspection and safety assessment will be conducted at least once during field activities to ensure compliance with corporate health and safety requirements and all applicable local, state, and federal health and safety requirements. The results of job site inspections and safety audits will be documented and submitted to the project file. Corrective actions will be completed, as necessary, and documented.

Site inspections and audits will not only be completed for all Parametrix operations, but also for all subcontractor operations, to ensure compliance with applicable site health and safety requirements. Observed health and safety deficiencies will be reported to the Parametrix Project Manager and the subcontractor Project Manager, as needed.

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7. PROJECT/EMERGENCY CONTACTS AND PROCEDURES

The project and emergency contacts for the NRE project are shown in Table 7 1.

Table 7-1. Project and Emergency Contacts

Name	Role	Phone Number
Alan Goodman	EPA Region 10 Task Order Project Officer	(503) 326-3685
Brad Hermanson, Parametrix	Project Manager	(503) 736-4805 (b) (6) cell
Jeff Montera, CDM	Project Manager	(720) 264-1116 (b) (6) cell
Sheila McConnell, CIH	Parametrix Corporate Health and Safety Officer	(425) 452-8655 (b) (6) cell
Chuck Myers, CIH	CDM Corporate Health and Safety Director	(703) 968-0900 (b) (6) cell
Dee Warren, CDM	Site Manager	(720) 264-1121 (b) (6) cell
Nicole Bielecki	Field Health and Safety Officer	(720) 264-1156
Emergency (fire, accident, etc.)	–	911
Merle West Medical Center	–	(541) 882-6311
Klamath Falls Police Department	–	(541) 883-5336
Klamath County Sheriff's Office	–	(541) 883-5130
Oregon State Police – Klamath Falls Area Command	–	(541) 947-2267
Oregon Emergency Response System (OERS)		800-452-0311
National Response Center (NRC)		800-424-8802
Oregon OSHA (Medford, Oregon)		541-776-6016
One Call Concepts Locating Services, Inc.		503-246-6699
Poison Control	–	1-800-222-1222

7.1 EMERGENCY ASSISTANCE

Table 7 1 provides a list of emergency telephone numbers. This list is to be conspicuously posted near the telephone or other communication network set up at the site to summon outside emergency assistance.

High-powered, hand-held radios will be available for on-site communications; these units have been tested at the site, and no repeater should be required. A land-line telephone has been connected at the garage/ command post, and is available at all times in case of emergency.

Appendix B includes a map and directions to the nearest hospital (Merle West Medical Center).

7.2 POTENTIAL INCIDENTS

Although considered unlikely, the following situations could occur and would require an emergency response action:

- Problems due to contacting utility lines (gas, electric, water)
- Fire
- Medical emergency
- Overt exposure (skin contact, inhalation, ingestion)

Utilities

If aboveground or underground utilities are damaged or contacted, notify the local fire department. If injury occurs, see the Medical Emergency discussion, below.

Fire

In the event of a fire, notify the site or system owner/operator and summon the fire department.

Medical Emergency

At least one Parametrix employee or on-site worker will have current certification in first aid and cardiopulmonary resuscitation (CPR). In the event of a serious injury or illness, paramedics (i.e., fire department) must be summoned immediately. Workers with suspected back or neck injuries are not to be moved until professional emergency assistance arrives. If there is evidence of serious trauma or unknown chemical exposure, the employee should be stabilized by the Health and Safety Officer or designee while the paramedics or an ambulance is immediately summoned.

For non-life-threatening injuries that do not impair driving ability, site personnel will drive to Merle West Medical Center in Klamath Falls. Appendix B illustrates the route to the hospital.

A first aid kit will be available at the site for use in case of minor injuries. First aid responders should protect themselves from contact with blood and other human body fluids by wearing latex gloves or establishing an equivalent barrier. Any contact with blood should be reported to the Health and Safety Manager.

Exposure

In the event of respiratory exposure, dermal or eye contact, or ingestion, the following procedures will be followed:

- **Respiratory Exposure (Inhalation).** Move to fresh air. Summon paramedics and notify facility or system owner/operator. Any loss of consciousness or exposure to elevated levels of known toxic contaminants, even if the individual appears to have fully recovered, will require immediate treatment and/or surveillance by a qualified physician.
- **Dermal Contact.** Flush area with copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention.
- **Eye Contact.** Flush eye(s) for a period of 15 minutes and transport worker to the nearest emergency medical facility. Treatment and/or surveillance by a qualified physician is required.

- **Ingestion.** Notify the local or National Poison Control Center and/or emergency medical facility and immediately transport to the facility.

7.3 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the Field Manager will determine if sampling activities can continue without endangering field personnel. Some of the conditions to be considered prior to determining if activities should continue are as follows:

- Potential for thermal stress (e.g., heat or cold stress) and related injuries.
- Dangerous weather related working conditions (e.g., high winds, rain, snow, fog, lightning).
- Limited visibility.
- Potential for electrical storms. No outside activities will be permitted during electrical storms.

7.4 SPILLS

Spills into waterways are a major environmental and regulatory concern. The only chemicals likely to be brought on site are typical fuels in a vehicle fuel tank and possibly a small amount (less than 8 ounces) of hexane or other solvent to assist in decontamination. The material safety data sheets (MSDS) for the solvent will be maintained with this safety plan and available as needed. If a spill should occur, personnel will notify the Parametrix Project Manager immediately, and a decision will be made to call 911 or a spill response contractor. Parametrix personnel are trained and capable of wiping up a small amount of hexane, but they will not respond to a fuel spill, especially gasoline. In the case of a fuel spill, the crew will move to a safe location and notify the fire department by calling 911. In the event of an oil or combustible or flammable material spill on the water, the Parametrix Project Manager or his/her designee will call the local Fire Marshall's office as well as the U.S. Coast Guard.

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8. STANDARD OPERATING PROCEDURES

The following project-related standard operating procedures (SOPs) are included in Appendix C:

- Personal Protective Equipment (SOP HS-002).
- Respiratory Protection Program (SOP HS-003).
- Handling of Investigation Derived Waste (SOP HS-006).
- Decontamination (SOP HS-007).
- Heat Stress (SOP HS-010).

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9. REFERENCES

E&E (Ecology and Environment). 2005. MBK partnership/North Ridge Estates Subdivision Responsible Party Removal Action Report, Klamath Falls, Oregon.

Parametrix. 2003. Parametrix Health and Safety Manual. Prepared for EPA Region 10. March 2003.

PBS (PBS Environmental Engineering). 2004. Report of Surficial Removal and Burial Location Actions, North Ridge Estates, Klamath Falls, Oregon.

_____ 2004. Burial Pile Stabilization Report, North Ridge Estates, Klamath Falls, Oregon.

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APPENDIX A

Forms

PROJECT-SPECIFIC TRAINING ACKNOWLEDGEMENT FORM FOR HAZARDOUS WASTE OPERATIONS

Prior to the initiation of field activities, I attended a site-specific training for the North Ridge Estates project. The training included topics that are covered in the Parametrix Health and Safety Manual and the project-specific Health and Safety Plan (HASP). Additionally, I have been given an opportunity to read and question the contents of these documents.

By signature, I certify that I have read, understood, and agree to comply with the information and directions set forth in the aforementioned documents and site-specific training. I further certify that I am in full compliance with OSHA 29 CFR 1910.120 in regards to training and medical monitoring requirements, as well as all other federal, state, and local regulations in regards to training and medical requirements.

SITE-SPECIFIC OPERATIONS, POTENTIAL HAZARDS, AND CONTROL		
PRINTED NAME	**SIGNATURE**	**TRAINING DATE**

DATE:	MEETING LOCATION:
TRAINER:	TITLE:
COMMENTS/EXCEPTIONS/EXEMPTIONS:	
TRAINER SIGNATURE:	

PARAMETRIX
DAILY HEALTH AND SAFETY TAILGATE
MEETING LOG

DATE/TIME	NAME (PRINT)	NAME (SIGNATURE)	TOPIC

APPENDIX B

Map and Directions to the Hospital

MAPQUEST.

Send To Printer Back To Directions

Start: **[4238-4335] Old Fort Rd**
Klamath Falls, OR 97601, US

End: **2865 Daggett Ave**
Klamath Falls, OR 97601-1106, US

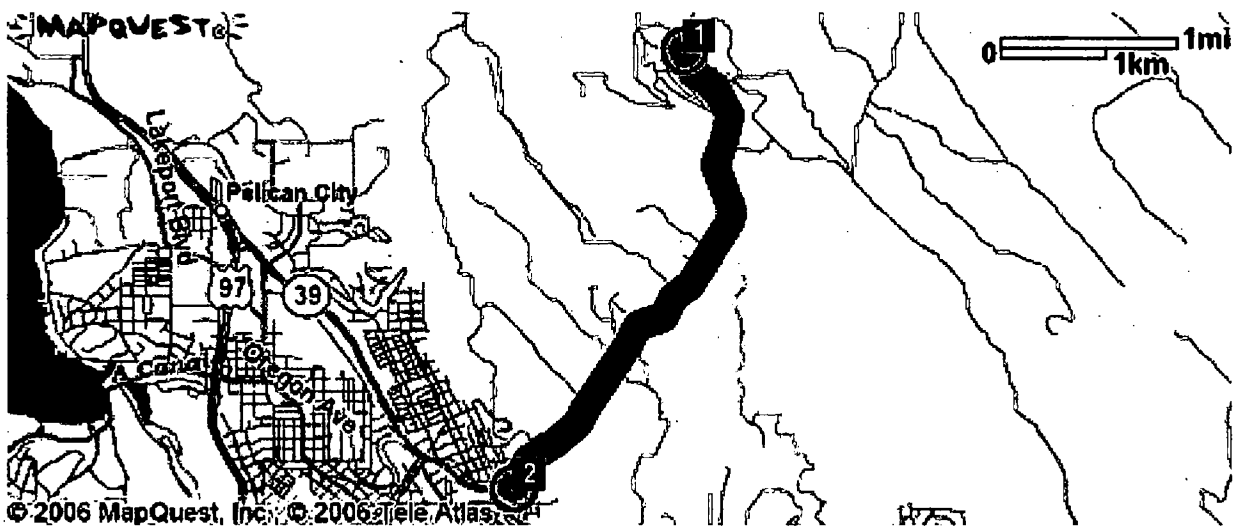
Notes:

Only text visible within note field will print.

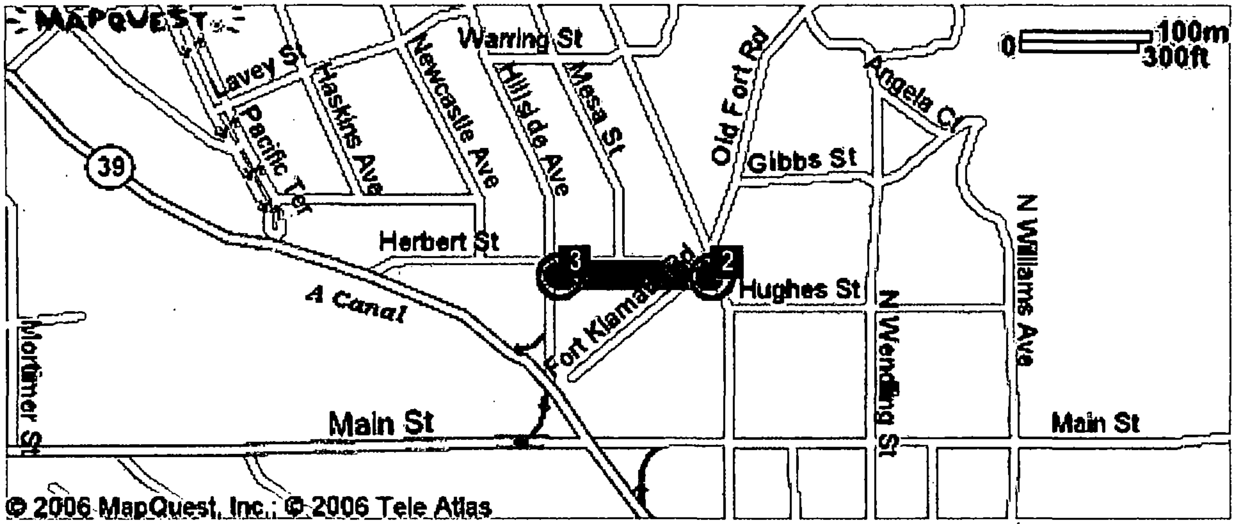
Directions **Distance**

Total Est. Time: 13 minutes **Total Est. Distance:** 5.66 miles

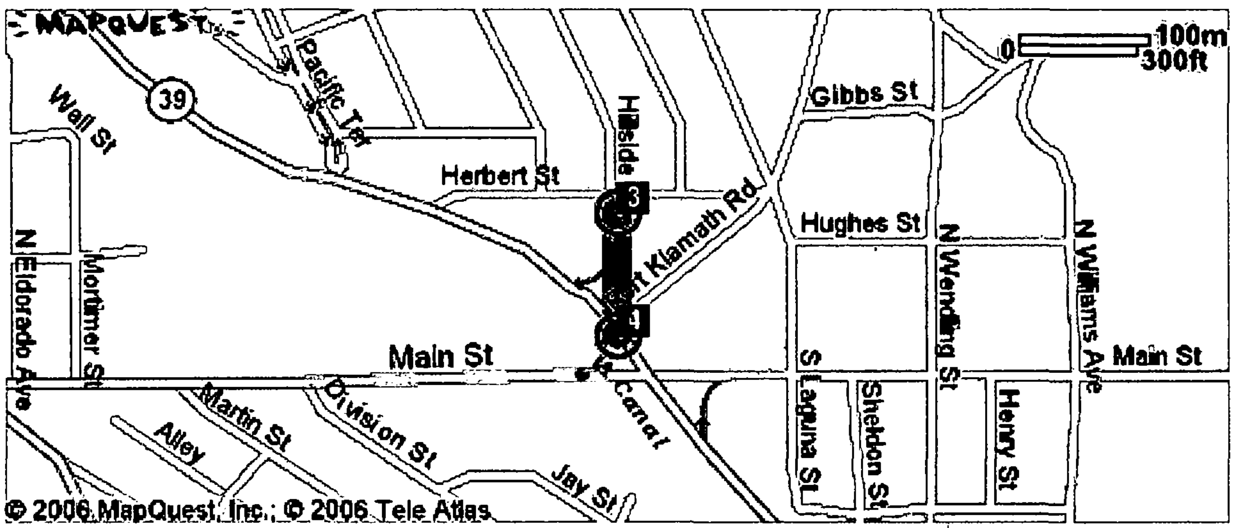
START	**1:** Start out going SOUTHWEST on OLD FORT RD / OREGON BLVD toward 3RD ST. Continue to follow OLD FORT RD.	3.2 miles



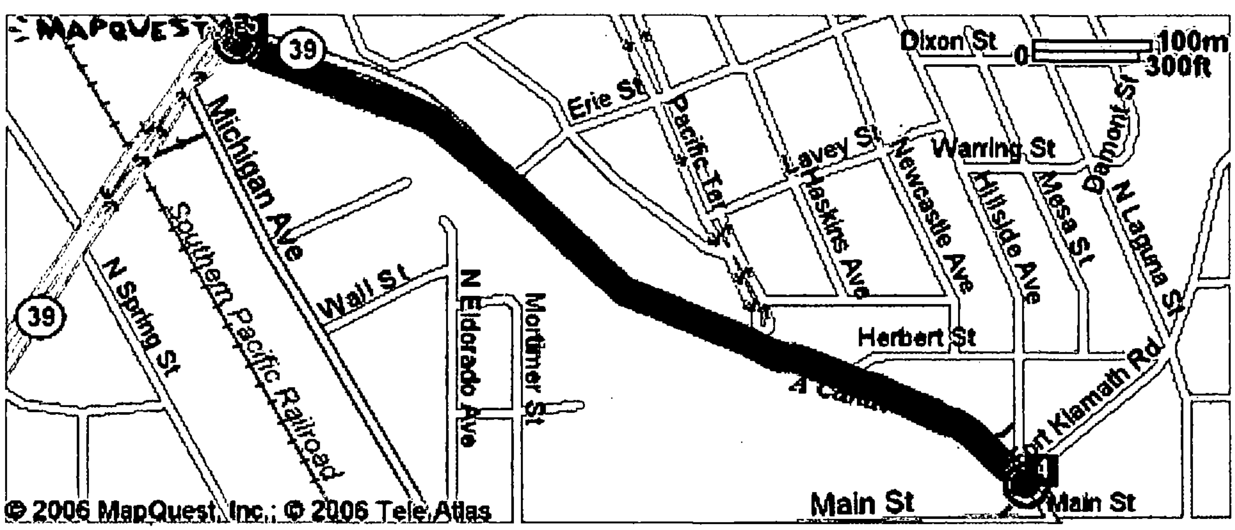
	2: Turn RIGHT onto HERBERT ST.	<0.1 miles



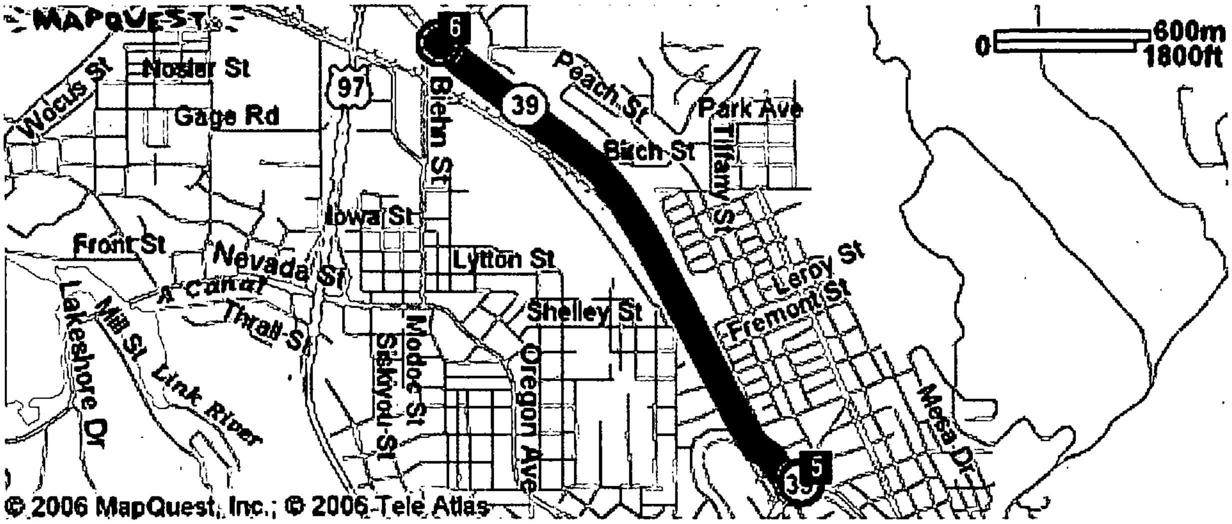
3:Turn LEFT onto HILLSIDE AVE. <0.1 miles



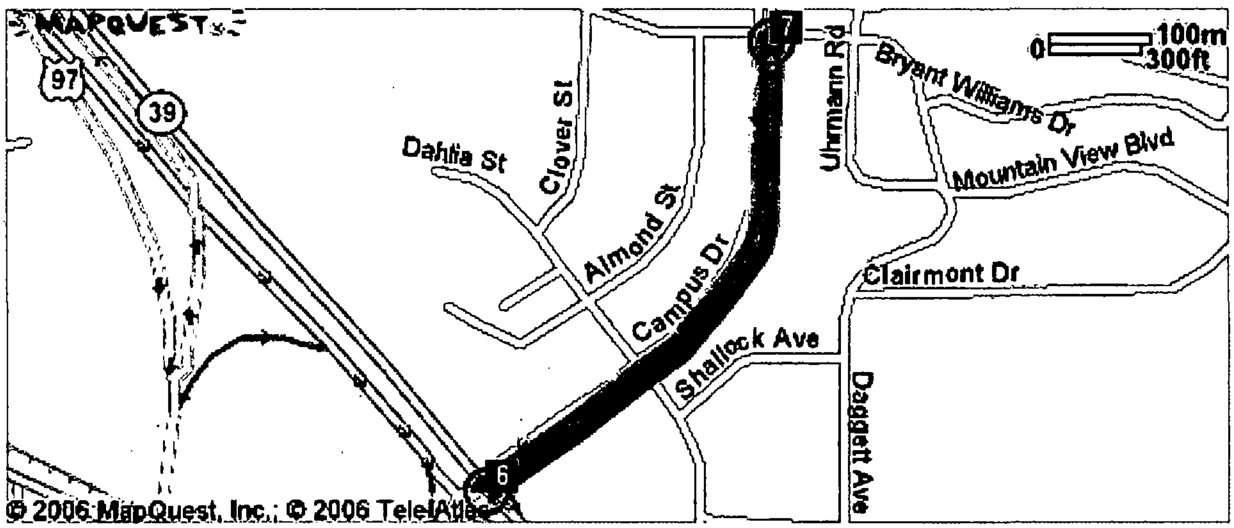
4:Turn SHARP RIGHT onto OR-39. 0.4 miles



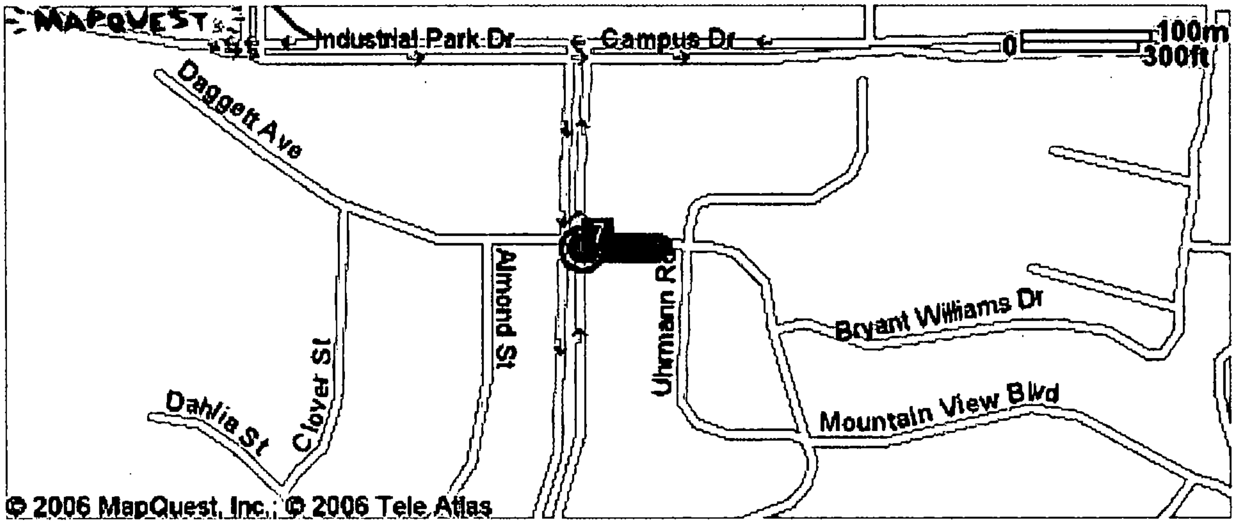
NORTH 97 BR **5:**Stay STRAIGHT to go onto KIT CARSON WAY / OR-39 N / US-97 BR N. 1.4 miles



6:Turn RIGHT onto CAMPUS DR. 0.3 miles

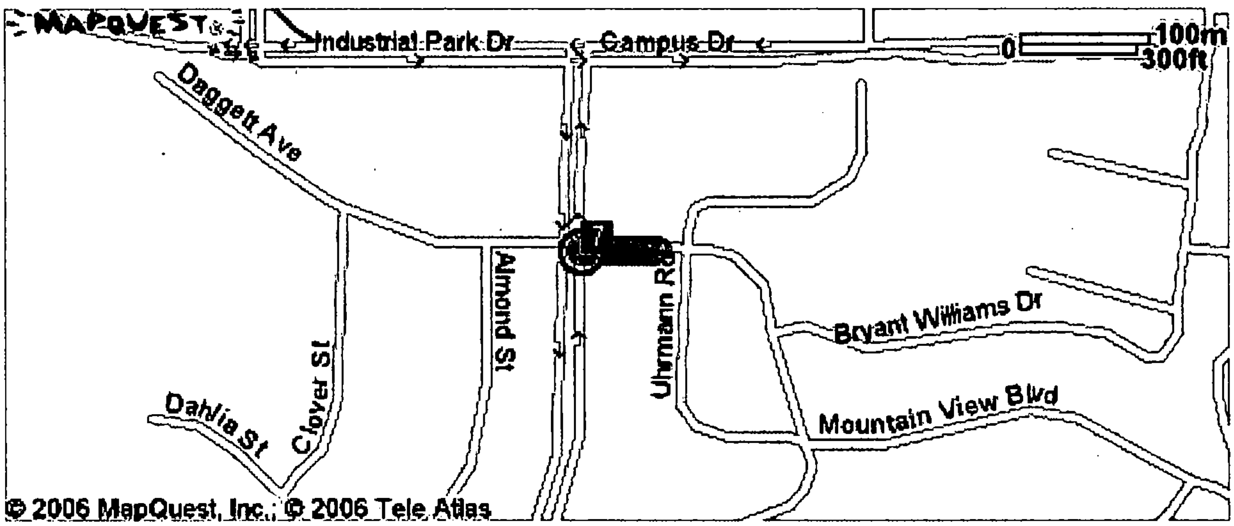


7:Turn RIGHT onto DAGGETT AVE. <0.1 miles

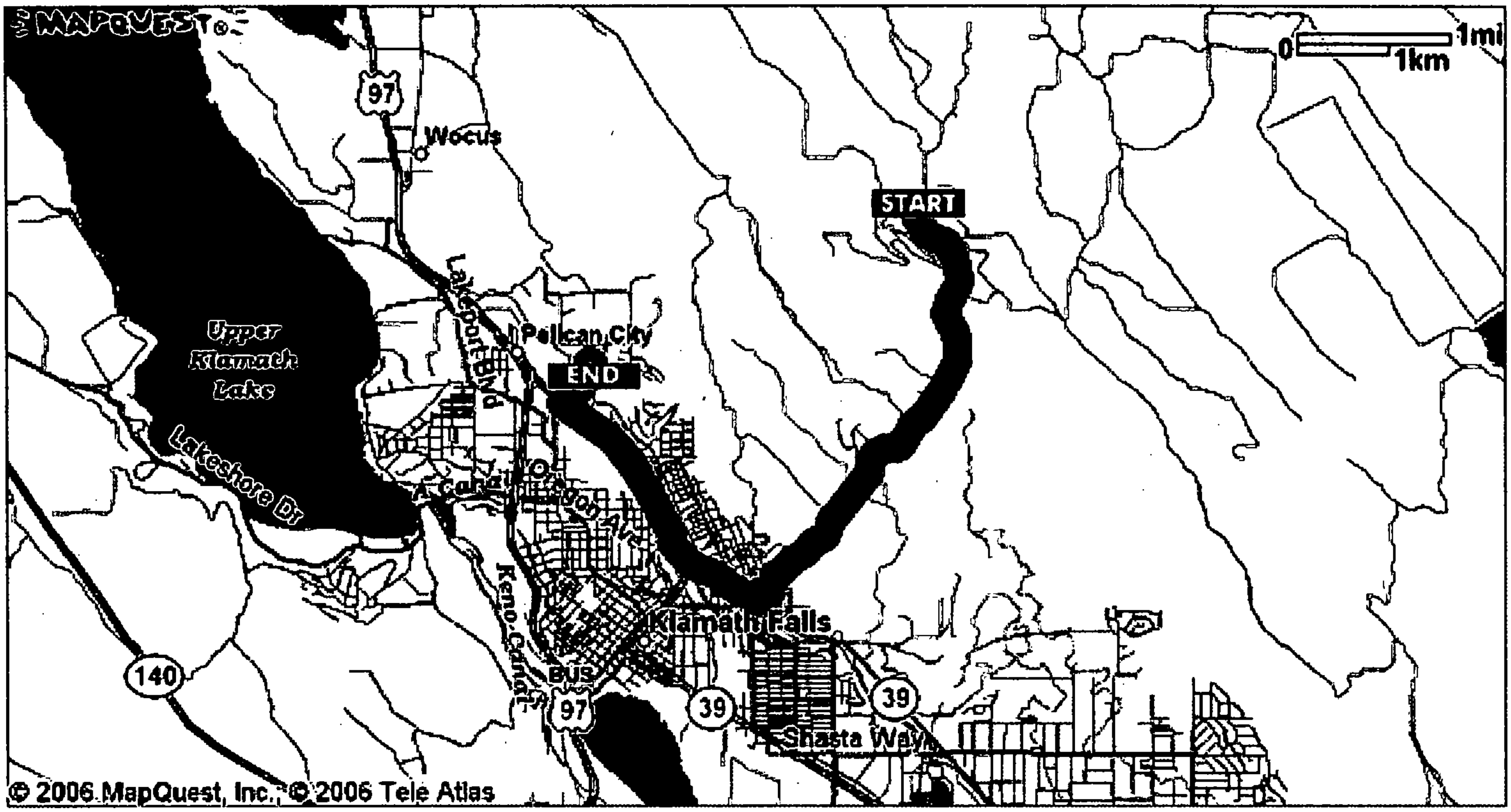


END

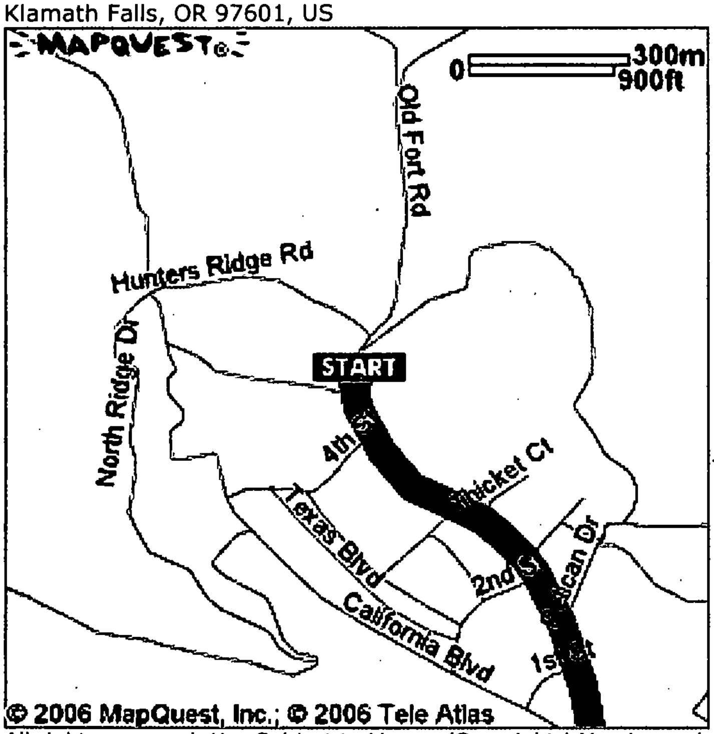
8: End at **2865 Daggett Ave**
Klamath Falls, OR 97601-1106, US



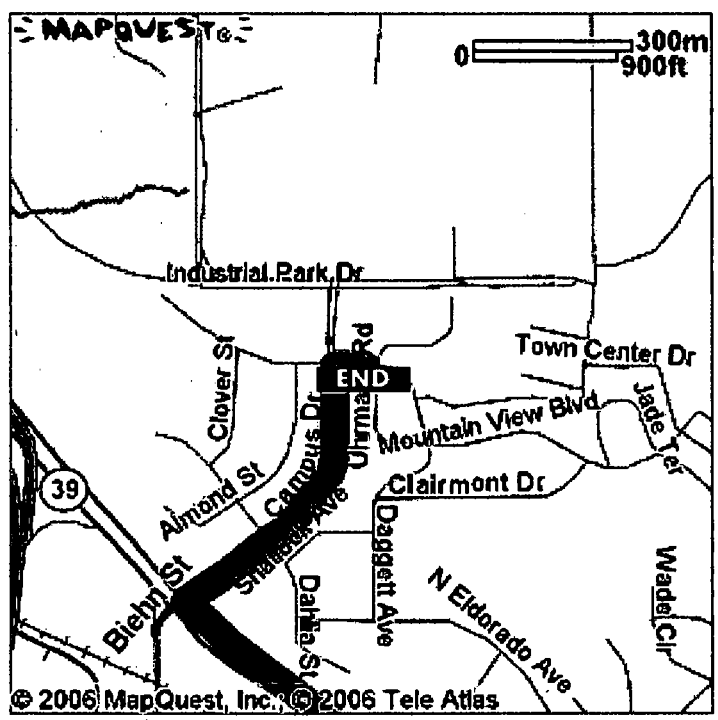
Total Est. Time: 13 minutes**Total Est. Distance:** 5.66 miles



Start:
[4238-4335] Old Fort Rd
Klamath Falls, OR 97601, US



End:
2865 Daggett Ave
Klamath Falls, OR 97601-1106, US



These directions are informational only. No representation is made or warranty given as to their content, road conditions or route usability or expeditiousness. User assumes all risk of use. MapQuest and its suppliers assume no responsibility for any loss or delay resulting from such use.

APPENDIX C

Standard Operating Procedures

Standard Operating Procedures

PERSONAL PROTECTIVE EQUIPMENT

Prepared By:	____________________ Health and Safety Committee Chair	Date:	__________
Reviewed By:	____________________ Corporate Health and Safety Officer	Date:	__________
Approved By:	____________________ Chief Operating Officer	Date:	__________

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines for selection and use of Personal Protective Equipment (PPE) used to protect Parametrix employees from the risk of injury by creating a barrier against workplace hazards.

2.0 Scope

29 CFR 1910, Subpart I requires the use of PPE to reduce employees' exposures to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. Employers are required to determine all exposures to hazards in their workplace and determine if PPE should be used to protect their workers. OSHA requires employers to conduct inspections of all workplaces to determine the need for PPE and to help in selecting the proper PPE for each task performed.

This SOP addresses eye, face, head, foot, hand, and body protection. Respiratory protection is discussed in SOP HS-003.

3.0 Responsibilities

There are specific responsibilities for Parametrix personnel in the care and use of PPE, depending on an individual's role within the company or on a given project. These responsibilities are outlined below:

- **Corporate Health and Safety Officer (CHSO):** The Corporate Health and Safety Officer is responsible for developing the PPE Program and updating PPE procedures, as necessary.
- **Project Manager:** The Project Manager is responsible for field implementation of the PPE Program. This includes assurance that all personnel on site comply with the policy and that all on-site personnel have had proper training in using PPE.
- **Site-specific Health and Safety Officer (SHSO):** The Site-specific Health and Safety Officer is responsible for initial on-site coordination of the cold stress. The SHSO assures that all personal potentially exposed to potential environmental hazards have proper PPE.
- **Team Member:** Each Team Member is responsible for understanding and complying with all site requirements.

4.0 Requirements

Eye and Face Protection

Eye and face protection shall be used when employees are exposed to potential hazards from flying particles, molten metal, acids or caustic liquids, chemicals, or gases. Eye and face protection requirements include:

- Appropriate eye and face protection devices in hazardous environments for personnel who wear contact lenses.
- Side protectors when there is a hazard from flying objects.
- Goggles and face shields when there is a hazard from chemical splash.
- Face shields worn only over primary eye protection (safety glasses or goggles).
- Eye protectors that incorporate an employee's corrective eye prescription in the design or that fit properly over the prescription lenses.

Emergency eyewash facilities meeting the requirements of ANSI Z358.1 will be provided in all areas where the eyes of any employee may be exposed to corrosive materials. All such emergency facilities will be located where they are easily accessible in an emergency.

Protective eye and face devices purchased after July 5, 1994 shall comply with ANSI Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection."

Head Protection

Head protection (hard hat) must be worn by all employees when overhead hazards from falling or fixed objects are present. Also, when an employee is near exposed electrical conductors that could come in contact with the head, the employee must wear a protective helmet designed to reduce electrical shock hazard.

Protective headgear shall comply with ANSI Z89.1-1986, "American National Standard for Personnel Protection-Protective Headwear for Industrial Workers-Requirements."

Foot Protection

Steel-toed boots or shoes must be worn in work areas where carrying or handling materials such as packages, objects, parts, or heavy tools could be dropped or fall onto the feet. Safety shoes or boots with puncture protection are required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal, etc., could be stepped on by employees and cause foot injury.

When working with hazardous chemicals or waste, chemical-resistant, steel-toed boots may be required.

All safety footwear shall comply with ANSI Z41-1991, "American National Standard for Personal Protection – Protective Footwear."

Hand Protection

Suitable gloves shall be worn when hazards from chemicals, cuts, lacerations, abrasions, punctures, burns, and other hazards to the hands are present. Glove selection shall be based on performance characteristics of the gloves, conditions, durations of use, and hazards present.

The first consideration in the selection of gloves for use against chemicals is to determine, if possible, the nature of the substances to be encountered. Employees must read instructions and warnings on chemical container labels and MSDSs before working with any chemical.

Body Protection

Suitable body protection (torso and legs) must be worn while completing job tasks. Depending on the hazards present, body protection may include coveralls, Tyvek or Saranex suits, totally encapsulating suits, etc. The type of body protection required to perform a specific task will be determined by the Corporate or Site-specific Health and Safety Officer, as necessary.

5.0 Training

Any worker required to wear PPE shall receive training in the proper use and care of PPE. The training shall include, but not necessarily be limited to, the following subjects:

- Determining when wearing PPE is necessary.
- Determining the appropriate and necessary PPE.
- Learning how to properly wear, adjust, and remove PPE.
- Understanding the limitations of PPE.
- Understanding the proper care, maintenance, and disposal of PPE.

6.0 References

U.S. Department of Labor, OSHA Standard 29 CFR 1910, Subpart I.

RESPIRATORY PROTECTION PROGRAM

Prepared By:	______________________ Health and Safety Committee Chair	Date:	__________
Reviewed By:	______________________ Corporate Health and Safety Officer	Date:	__________
Approved By:	______________________ Chief Operating Officer	Date:	__________

1.0 Purpose

To establish the minimum requirements for Parametrix, Inc. employees to use respiratory protection.

2.0 Scope

This Standard Operating Procedure (SOP) applies in its entirety to all Parametrix projects unless the Corporate Health and Safety Officer (CHSO) grants a variance.

3.0 Responsibilities

There are specific responsibilities for Parametrix personnel in complying with the Respiratory Protection Program, depending on an individual's role within the company or on a given project. These responsibilities are outlined below:

- **Project Manager:** Overall responsible for establishing and ensuring compliance with this procedure.
- **Field Health and Safety Staff:** Responsible for implementing and/or monitoring activities associated with this procedure.
- **Managers and Supervisory Personnel:** Responsible for enforcing this procedure and ensuring that each employee is properly following the procedure.

4.0 General Requirements

Respirator wearers cannot be afforded protection from hazardous airborne contaminants when conditions prevent a complete gas-tight face seat. Facial hair, head hair, and eyeglasses are among these physical obstructions. While eyeglasses are in the category of obstructions that prevent a gas-tight face seal, primarily in the case of full-face supplied-air respirators, this problem is correctable by using mounting devices to hold the eyeglass frames inside the respirator face piece. The criteria state that there can be no obstruction of contact between the wearer's skin and the mask. Beard stubble constitutes a physical obstruction. Affected employees shall be required to be clean-shaven, as a condition of employment.

Candidates for employment who object to this policy shall be made aware that their versatility on work assignments may be limited and that this factor can affect their job assignments.

Parametrix shall provide respirators whenever a qualified person determines that such equipment is necessary to protect the health of the employee from significant inhalation exposure.

Only respirator equipment that has been jointly approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) shall be provided.

Employees shall be instructed and trained in the need, use, sanitary care, and limitations of such respiratory equipment prior to being assigned to activities that require respiratory protection.

Parametrix shall provide, repair, or replace respiratory protective equipment as may be required due to wear and deterioration.

Means of cleaning all respiratory protective equipment shall be provided.

Only those employees who are trained and medically qualified to wear respirators shall be assigned to work requiring use of respirators.

5.0 Implementation

Respiratory Selection

When respirator use is required, only properly cleaned and maintained NIOSH/MSHA-approved respirators shall be used. Single-use respirators (dust masks) may only be used with specific approval by the Corporate Health and Safety Officer.

Employees shall be allowed to pick the most comfortable respirator from a selection, including respirators of various sizes from different manufacturers.

Selection of respirators shall be approved by the Field Health and Safety Staff in all cases, and shall be based on the following considerations:

- Nature of the Hazard – The chemical and physical properties, toxicity, and concentration of hazardous material or mixture of materials.
- Oxygen-deficient Atmospheres – Entry into oxygen-deficient atmospheres is prohibited without prior approval of the Corporate Health and Safety Officer.
- Immediate Dangerous to Life and Health (IDLH) Atmospheres – Entry into any IDLH atmosphere is prohibited without prior approval of the Corporate Health and Safety Officer.
- Irritant or Corrosive Atmospheres – Respirators selected must provide adequate face and eye protection. The contaminant or mixture of contaminants must have adequate warning properties (odor, irritation, or taste) to indicate respirator breakthrough if an air-purifying device is used.

- Regulated Materials – In all cases where OSHA has required that a specific respirator is used (carcinogen standards, etc.), the specified respirator, or one providing equal or better protection, shall be used.

- Air-purifying respirators shall NOT be used for protection against the materials listed below. Note that this is only a partial list; please contact the Field Health and Safety Staff for further information:

Acrolein	Methyl chloride
Aniline	Methylene chloride
Arsine	Nickel carbonyl
Bromine	Nitrobenzene
Carbon monoxide	Nitrogen oxides
Ollsocyanates	Nitroglycerine
Dimethylaniline	Nitromethane
Dimethyl sulfate	Ozone
Hydrogen cyanide	Phosgene
Hydrogen fluoride	Phosphine
Hydrogen selenide	Phosphorus trichloride
Hydrogen sulfide	Stibine
Methanol	Sulfur chloride
Methyl bromide	

Parametrix subcontracts most asbestos inspections and all asbestos abatement. Inspection personnel may use half-mask respirators in areas where asbestos is present if they are qualitatively-fit tested.

Full–facepiece, negative-pressure, air-purifying respirators are not acceptable for protection against asbestos exposure unless the wearer meets the quantitative fit testing requirement.

Use of Corrective Lens Eyewear with Respirators

The wearing of contact lenses in work environments that involve exposure to chemical fumes, vapors, splashes, intense heat, molten metals, or highly particulate-contaminated atmosphere is prohibited.

Management shall assess which employees in their operations wear eye glasses routinely, determine what respiratory protective masks (makes and models) are used, and assure that the appropriate frames or ophthalmic device hangers are obtained and provided at company expense.

Employee Training and Instruction

The basic respiratory training program shall include, as a minimum, the following:

- Instruction in the need for, use, sanitary care, and limitations of each respirator type.
- Opportunity for "hands-on" experience with respirators.
- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.
- How to perform a positive and negative pressure test of the face piece to face seal.
- A familiarization period of wear in normal air.
- For negative pressure respirators, qualitative fit testing will be conducted by wearing the respirator in an irritant fume test atmosphere. A qualified person using the protocol found in Attachment A of this procedure shall perform all qualitative fit testing or other protocol, as designated by specific standards (e.g., asbestos, benzene). Powered air-purifying respirators (PAPRs) shall be worn in a test atmosphere with the power supply disconnected to evaluate fit in the negative pressure modes.
- Qualitative fit testing shall be performed annually, or more frequently as required by law. Quantitative fit testing may be required for some respirator or contaminants. The Field Health and Safety Staff will determine fit test requirements. Fit testing procedures are presented in Attachment A.
- Instruction in the nature of the respiratory hazards, whether acute, chronic, or both, and a description of potential health effects if the respirators are not used.
- Classroom and field training to recognize and cope with emergency situations (including respirator failure).

Training provided as part of this procedure shall be performed in accordance with applicable regulations.

Respirator Inspection, Cleaning, Maintenance, and Storage

General: The Field Health and Safety Staff will define and provide a program to area/facility management regarding maintenance and care of respirators, and which shall be adjusted to the type of facility, working conditions, and hazards involved. This program shall include the following basic elements:

- Inspection for defects and/or deterioration.
- Cleaning and disinfecting in accordance with manufacturers' instruction.
- Repair, as necessary.

- Establishment and maintenance of a record-keeping system to document respiratory inspection, repair, and maintenance.

- Proper storage.

Inspection, Maintenance, and Storage

Users shall inspect all respirators routinely before, during, and after each use. Any defects shall be reported to the supervisor. No defective respirators shall be issued or worn. Defective respirators shall be tagged and returned for repair.

Respirators maintained for emergency use (such as SCBA) shall be inspected and sanitized after each use and inspected at least monthly. A record of the most recent inspection shall be maintained on the respirator or the storage container and shall include the inspector's identification, the date, and a respirator identification number.

An individual who is qualified by experience or training shall regularly clean, inspect, and sanitize routinely-used respiratory equipment.

Other types of respiratory equipment shall be maintained according to the manufacturers' instructions.

Where respirators are assigned to individual employees, area management shall ensure compliance with cleaning and maintenance requirements by periodically inspecting respiratory equipment and conducting field audits.

Respiratory equipment shall not be passed from one person to another until it has been cleaned and sanitized.

When not in use, respirators shall be stored to protect against dust, sunlight, extreme temperatures, excessive moisture, damaging chemicals, and physical damage.

Air Purifying Respirators (APR)

Fit testing shall be accomplished In accordance with Attachment A of this procedure.

When APRs are worn, employees shall change the filter-cartridge elements daily, in the case of cartridges used for non-particulate contaminants, or sooner if "breakthrough" is occurring. For other filter cartridges, the filter-cartridge should be replaced whenever an increase in breathing resistance is detected.

Powered Air Purifying Respirators (PAPR)

When PAPRs are worn, employees shall change filter/cartridge elements dally, in the case of cartridges used for non-particulate contaminants, or sooner if "breakthrough" is occurring. For other filter cartridges, the filter-cartridge should be replaced if any of the following scenarios occur:

- Whenever an increase in breathing resistance is detected, or
- When airflow through filter elements decreases to an unacceptable level, as indicated by the manufacturer's test device.

Compressed Air Systems

- Air Quality
  - Compressed air used for respiration shall be of high purity, and shall meet, as a minimum, the requirements for the specification for Grade D or better breathing air as described in Compressed Gas Association Specification G-7.1 (ANSI Z86.1-1973). The supplier shall certify compliance with these requirements for each lot of breathing air supplied.
  - Breathing air shall be free from harmful dusts, fumes, mists, vapors, gases, or odors.
  - Oxygen shall NOT be used at any time in open-circuit SCBAs or in air-line respirators.
  - Mixed or blended air shall not be used for breathing purposes.

Compressed Air Cylinder Systems (Cascade)

Breathing air cylinders shall be legibly identified with the word AIR, by means of stenciling, stamping, or labeling as near to the valve end as practical.

Cascade systems shall be equipped with low-pressure warning bells or similar warning devices to indicate air pressure in the manifold below 500 psi.

When a cascade system is used to supply breathing air, one employee shall be assigned as a safety standby within audible range of the low- pressure alarm.

When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and a coupling rated at a capacity of at least 3,000 psi.

Air-line couplings shall be incompatible with outlets for other gas systems to prevent inadvertently supplying air-line respirators with non-respirable gases or oxygen.

The air pressure at the hose connection to positive pressure respiratory equipment shall be within the range specified in the approval of the equipment by the manufacturer.

Cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and, in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for this purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125°F. Cylinders with visible external damage, evidence of corrosion damage, or exposure to fire shall not be accepted or used.

Only cylinders within current hydrostatic test periods shall be used.

Compressor Supplied Breathing Air

All compressors used for supplying breathing air shall be equipped with the following safety and standby devices:

- Compressor intakes that are located to ensure that only respirable (uncontaminated) air is admitted. This requires attention to the location of the compressor intake with respect to compressor engine exhaust, chemical storage or use areas, and suitable intake screening or filtration.

- Alarms to indicate compressor failure (such as low-pressure air horns, etc.) shall be installed in the system.

- A receiver of sufficient capacity to enable the respirator wearer to exit from a contaminated atmosphere upon compressor failure shall be provided.

- Oil Lubricated Compressors – If an oil-lubricated compressor is used to supply breathing air, it shall be equipped with both of the following devices:

    - A continuous-reading carbon monoxide monitoring system that is set to alarm should the carbon monoxide concentration exceed 10 ppm.

    - A high-temperature alarm which will activate when the discharge air exceeds 110% of the normal operating temperature in degrees Fahrenheit,

- A designated employee shall be assigned as a safety standby and shall remain continuously within audible range of the alarms.

- An inline purifying filter assembly to remove oil, condensed water, particulate, odors, and organic vapors shall be used in conjunction with the air compressor.

Routine inspection and maintenance of the air compressor shall be performed in accordance with manufacturer's specifications.

Escape/Egress Units

These respirators are intended for use in areas where escape with a short-term (5-10 minute) air supply is necessary. They may be used as adjuncts to airline pressure demand respirators as a backup air supply; or as independent emergency devices in areas where respiratory protection is not normally required.

Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.

Escape/egress units shall never be used as primary standby respirators for confined space entry.

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Medical Screening

All potential candidates shall complete a medical questionnaire prior to respiratory use and once every three years. A more comprehensive medical evaluation may be required based on the results of the questionnaire.

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that the employee is physically able to perform the work while using the required respirator.

If an employee demonstrates difficulty in breathing during the fitting test or during use, the employee shall be re-examined by a physician to determine whether the employee can wear a respirator while performing the required duty.

Once a medical determination has been made to physical ability to wear a respirator, a review of the employee's health status shall be conducted annually, at a minimum.

ATTACHMENT A

PARAMETRIX MANDATORY QUALITATIVE RESPIRATOR FIT TEST PROTOCOL

NOTE: This protocol does not satisfy the fit test requirements for certain materials, including asbestos and benzene. Contact the Field Health and Safety Staff for assistance.

Respirator Selection

Respirators shall be selected as described in this procedure. The respirator shall be equipped with HEPA filters.

Fit Test

The test conductor shall review this protocol with the test subject before testing.

The test subject shall perform the following conventional positive and negative pressure fit checks:

- Negative Pressure Test – Cover the cartridge filter inlets with your palm and gently inhale, the face piece should collapse against the face.
- Positive Pressure Test – Cover the exhalation valve cover with your palm and gently exhale. The face piece should expand away from the face.
- If either test fails, loosen and readjust the respirator straps and check for obstructions to the sealing surface. Repeat both tests. If the test fails again, select an alternate respirator.

A test atmosphere shall be generated with irritant smoke.

The test subject shall be advised that the smoke can be irritating to the eyes and instructed to keep the eyes closed while the test Is being conducted (applies to half-mask respirators).

While wearing the selected respirator, the test subject shall enter the test atmosphere and perform the following exercises:

- Breathe normally.
- Breathe deeply. Be certain breaths are deep and regular.
- Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against the shoulders.
- Nod head up and down. Be certain motions are complete and made every second. Inhale on each side. Do not bump the respirator against the shoulders.
- Nod head up and down. Be certain motions are complete and made every second. Inhale when head is in the full, up position (looking toward coiling). Do not bump the respirator against the chest.

- Talk aloud and slowly in a fashion that will generate a wide range of facial movements.
- Breathe normally.

The test subject shall indicate to the test conductor if the irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

Each test subject passing the smoke test (i.e., without detecting the smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. This may be performed by cracking the mask and gently inhaling while inside the test atmosphere. Failure to evoke a response shall void the fit test. This may trigger an asthmatic response; verify before beginning.

The test shall not be conducted if there is any hair growth between the skin and the face-piece sealing surface.

If hair growth or apparel interferes with a satisfactory fit, then the obstruction(s) shall be altered or removed to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator, such as a powered, air-purifying respirator, supplied air respirator, or self-contained breathing apparatus.

If a test subject exhibits difficulty in breathing during the tests, the subject shall be referred to a physician trained in respiratory diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing required duties.

Qualitative fit testing shall be repeated at least every year, or more often, as required by law. In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the last subject has experienced:

- A weight change of 20 pounds or more.
- Significant facial scarring in the area of the face-piece seal.
- Significant dental changes (i.e., multiple extractions without prosthesis, or acquisition of dentures).
- Reconstructive or cosmetic surgery.
- Any other conditions that may interfere with face-piece sealing.

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Record Keeping

The following fit test forms shall be maintained in each office for three years. The Corporate Health and Safety Officer shall maintain permanent records. The summary shall include:

- Name of test subject.
- Date of testing.
- Name of test conductor.
- Respirator selected (indicate manufacturer, model, size, and approval number).
- Testing agent.

HANDLING OF INVESTIGATION-DERIVED WASTE

Prepared By: ______________________ Date: ____________
Health and Safety Committee Chair

Reviewed By: ______________________ Date: ____________
Corporate Health and Safety Officer

Approved By: ______________________ Date: ____________
Chief Operating Officer

1.0 Purpose

Management of investigation-derived waste (IDW) minimizes the potential for the spread of hazardous waste on site or off site through investigation activities. The purpose of this Standard Operating Procedure (SOP) is to provide instructions for the proper management of contaminated materials derived from field investigations.

2.0 Scope

The procedures outlined are to be followed by all personnel who participate in site activities in areas where IDW is generated.

Materials that are known or suspected to be contaminated with hazardous substances through the actions of sample collection or personnel and equipment decontamination were said to be investigation-derived wastes. These wastes include decontamination solutions, disposable equipment, drill cuttings and fluids, and groundwater monitoring well development and purge waters. To the extent possible, the Site Manager will attempt to minimize the generation of these wastes through careful design of decontamination schemes and groundwater sampling programs. Testing conducted on soil and water investigation-derived wastes will show if they were also hazardous wastes as defined by RCRA. This will determine the proper handling and ultimate disposal requirements.

The criteria for designating a substance as a hazardous waste, according to RCRA, is provided in 40 CFR 261.3 if investigation-derived wastes meet these criteria, RCRA requirements must be followed for packaging, labeling, transporting, storing and record keeping as described in 40 CFR 262 34. Those wastes judged to potentially meet the criteria for hazardous wastes, shall be stored in Department of Transportation-approved, 55-gallon steel drums.

Wastes that can be shown not to be RCRA-designated hazardous wastes may be handled and disposed on site or off site to municipal wastewater and/or solid waste systems at the direction of the EPA RPM. Investigation-derived waste is assumed to be RCRA-designated hazardous waste unless analytical evidence indicates otherwise.

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3.0 Investigation-Derived Waste Management

Procedures that minimize the potential for the spread of hazardous waste include minimizing the volume of waste generated, waste segregation, appropriate storage, and disposal, according to RCRA requirements.

Waste Minimization

Within the absolute constraints demanded by worker health and safety and project quality assurance/quality control, the generation of investigation-derived wastes is to be limited. In the development of the investigation work plan, each aspect of the investigation is to be reviewed to identify areas where excess waste generation can be eliminated. General procedures that will eliminate waste include avoidance of unnecessary exposure of materials to hazardous waste, and coordination of sampling schedules to avoid repetitious purging of wells and use of sampling equipment.

Waste Segregation

Waste storage and handling procedures to be used depend on the type of generated waste. For this reason, investigation-derived hazardous wastes described below are segregated into separate, 55-gallon storage drums. Waste materials that are known to be free of hazardous waste contamination (such as broken sample bottles or equipment containers and wrappings), must be collected separately for disposal to municipal systems. Large plastic garbage or lawn and leaf bags are useful for collecting this trash.

Decontamination Solutions

Decontamination solutions are generated from washing and rinsing of personal protective equipment (PPE) and sampling equipment. Solutions considered investigation-derived wastes range from detergents, organic solvents, and acids used to decontaminate small hand samplers to steam cleaning rinsate used to wash drill rigs and other large equipment. These solutions are to be stored in 55-gallon drums with bolt-sealed lids.

Soil Cuttings and Drilling Mud

Soil cuttings are solid to semisolid soils generated during trenching activities, drilling for the collection of subsurface soil samples, or the installation of monitoring wells. Depending on the type of drilling, drilling fluids known as "muds" may be used to remove soil cuttings. Drilling fluids flushed from boreholes must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Drill cuttings, whether generated with or without drilling fluids, are to be removed with a flat-bottomed shovel and stored in 55-gallon drums with bolt-sealed lids.

Well Development and Purge Water

Well development and purge waters consists of groundwater removed from monitoring wells to repair damage to the aquifer following well installation, obtain characteristic aquifer groundwater samples, or measure aquifer hydraulic properties. The volume of groundwater to be generated will determine the appropriate storage procedure. These activities can generate significant volumes of groundwater depending on the well yield and the duration of the test or activity. Use of drums or large–volume, portable tanks such "Baker Tanks" should be considered for temporary storage of purge water.

Disposable Equipment

Disposable equipment includes used personal protective equipment such as Tyvek coveralls, gloves, booties and APR cartridges, and some inexpensive sampling equipment such as trowels or disposable bailers. This equipment is assumed to be contaminated if it was used at a hazardous waste site because it is impractical to submit these items for analysis. These materials should be stored on site in 55-gallon drums, pending final disposal.

Waste Storage

The wastes that accumulate through investigations must be stored on site prior to disposal. An on-site waste staging area should be designated to provide secure and controlled storage for the drums. Per RCRA requirements, storage cannot exceed 90 days for materials presumed or shown to be RCRA-designated hazardous wastes. Waste that is known not to be RCRA–designated, should be promptly disposed to municipal waste systems.

Storage Containers

Containers shall be DOT-approved (DOT 17H 18/16GA OH unlined), open top, steel drums. The lids should lift completely off the drum, and be secured by a bolt ring. Enough drums should be ordered to store all anticipated waste, including extra drums for solid waste and decontamination water. Solid and liquid wastes are not to be mixed in the drums.

Pallets are often required to allow transport of filled drums to the staging area with a forklift. Normal pallets are 3′ x 4′ and will hold two to three, 55-gallon drums, depending on the filled weight. If pallets are required for drum transport or storage, Parametrix field personnel are responsible for ensuring that the empty drums are placed on pallets before they are filled and that the lids are sealed on the drums with the bolt tighten ring after the drums are filled. Because the weight of one drum can exceed 500 pounds, under no circumstances should Parametrix personnel attempt to move the drums by hand. In addition, Parametrix personnel should not operate forklifts as part of their regular field activities. Removal of drums to the staging area is normally the responsibility of the client, unless other arrangements have been made.

Drum Labeling

Each drum that is used will be assigned a unique number that will remain with that drum for the life of the drum. This number will be written in permanent marker on the drum itself. Do not label drum lids. Drum labels shall contain the following information:

- Waste accumulation start date.
- Well number or boring number, if applicable.
- Drum number.
- Contents matrix (soil, water. slurry, etc.).

- Generation location.
- Project name.

4.0 Waste Disposal

Responsibility for the final disposal of investigation-derived waste will be determined before field activities are begun and shall be described in the investigation work plan. Disposal or long-term storage (over 90 days) of RCRA-designated hazardous wastes requires procedures that are beyond the scope of this SOP. The Parametrix Hazardous Waste Management Program is presented in SOP HS-005.

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DECONTAMINATION

Prepared By:	____________________ Health and Safety Committee Chair	Date:	__________
Reviewed By:	____________________ Corporate Health and Safety Officer	Date:	__________
Approved By:	____________________ Chief Operating Officer	Date:	__________

1.0 Purpose

This Standard Operating Procedures (SOP) provides instructions for personnel and equipment decontamination that are to be followed during field operations.

2.0 Scope

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and/or equipment at hazardous waste sites. Decontamination is required to protect personnel from the potential effects of hazardous substances and to minimize the spread of those substances. Decontamination methods include physical removal of contaminants, detoxification, and disinfection/ sterilization.

This SOP describes decontamination responsibilities and procedures to be implemented at hazardous waste sites. The procedures outlined are to be followed by all personnel who participate in site activities in areas that may contain hazardous substances. The scenarios of decontamination procedures presented here will not necessarily all be appropriate for a given site. Project procedures may be prepared as part of the Site-specific Health and Safety Plan (HSP) that focus on site-specific conditions and incorporate the appropriate procedures presented in this SOP.

This procedure applies in its entirety to all Parametrix projects unless the Corporate Health and Safety Manager (CHSO) grants a variance. Modifications to these procedures may be appropriate on a project-specific basis.

3.0 Responsibilities

There are specific responsibilities for Parametrix personnel in complying with the required decontamination procedures, depending on an individual's role within the company or on a given project. These responsibilities are outlined below:

- **Site-specific Health and Safety Officer:** The Site-specific Health and Safety Officer (SHSO) is responsible for maintaining and enforcing the project decontamination program. HSP decontamination procedures for all projects shall be reviewed and authorized by the

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CHSO. All modifications and/or changes must be noted in the field logbook, documented as HSP revisions, and initialed by all field personnel.

- **Site Manager:** The Site Manager is responsible for assuring that all site personnel become familiar with and follow the decontamination procedures described in this SOP or in the Site-specific HSP.

4.0 Personnel Decontamination Procedures

Contamination avoidance is the best way to prevent the spread of contaminants. Direct contact with contaminants should be minimized by not leaning against objects, and not kneeling or sitting on the ground; through the use of remote sample-handling and container-opening techniques, wherever appropriate; and through the use of disposable equipment, wherever appropriate.

Decontamination Program Planning

The SHSO shall research the background information on a particular site when planning decontamination procedures for the fieldwork at that site. The physical, chemical, toxicological, and pathogenic properties (if any), as well as the amounts and concentrations of each contaminant present at the site, are the determining factors in selecting the levels of protection for personnel and the extent of decontamination required. Sources of information for the characterization of hazardous waste sites include site records, state and federal agency files, and interviews with knowledgeable people. Hazardous and toxicological references, industrial process references, and manufacturers' handbooks are also good sources of information. Topography, local meteorological conditions (most probable wind direction. rainfall, etc.), and other site-specific features, are factors to consider in defining decontamination measures.

Decontamination Station Layout

When site conditions require, a dedicated area shall be established as a decontamination station. The decontamination station shall be located upwind of the Exclusion Zone. This is especially important when airborne contaminants are detected at above-background levels, or when such a potential exists. This is to prevent the airborne contamination of the Contamination Reduction Zone (CRZ) and the Support Zone. Exclusion, CRZ, and Support Zones are depicted in Figure I and defined as follows:

- **Exclusion Zone:** The zone encompassing the contaminated area that must be large enough to prevent the spread of contaminants beyond its boundaries. The extent of the Exclusion Zone will depend on:
  - Toxicity of the contaminants.
  - Physical form of the contaminants (solid, liquid, or gas).
  - Amounts and concentrations of the contaminants.
  - Fire and explosive potential of contamination.
  - Site-specific conditions such as topography and meteorology, and potential and active migration pathways to air, water, and soil.

- **Contamination Reduction Zone (CRZ):** The area between the Exclusion and Support Zones where contamination is controlled and/or removed. A contamination reduction corridor is an area within the CRZ that is the point of entry and exit for personnel to and from the Exclusion Zone.

- **Support Area:** The Support Area is separated from the CRZ by the contamination control line (CCL). The Support Area must be free from all contamination at all times.

The boundaries of the decontamination station should be clearly visible to all field personnel. The decontamination line should be set up along a straight line to facilitate identifying each station in the decontamination process. Movements to and from the exclusion zone will only be via the decontamination corridor.

Site-specific conditions to consider when locating the decontamination station are the location(s) of field investigation activities, accessibility to site personnel, and site terrain and safety. The decontamination station should be moved if site investigation activities are moved significantly.

The SHSO will determine if gross contamination has spread beyond the Exclusion Zone if wind direction changes (when airborne contaminants are suspected), inclement weather develops, or other site-specific factors arise.

Multiple decontamination stations may be deemed necessary by the SHSO, depending on the particular project.

Decontamination equipment materials and supplies are generally selected on the basis of availability and compatibility with contaminants encountered. Other considerations include ease of equipment decontamination, disposability, and site-specific requirements. Recommended equipment for a decontamination station includes the following:

- Plastic sheeting, or other suitable materials, on which the decontamination tubs, clean equipment, and contaminated equipment can be set down.

- Long-handled, soft-bristled wire or other scrub brushes to help scrub off contaminants.

- Large plastic or steel tubs or other suitable tubs. These should be large enough for a worker to step in.

- Paper towels for drying protective clothing and equipment.

- DOT-approved drums with lids for contaminated wash and rinse solutions, for contaminated disposal items and for trash cans.

- Washcloths, soap, and towels for hand rinse.

- Pressurized spray cans for deionized/distilled water.

- Portable shower facilities for full-body wash (it needed).

- Folding chairs and tables.

- Pocket knife.
- Stakes and rope for marking the hot zone limits.
- First Aid kit.
- Decontamination solutions and detergents.
- Distilled and deionized water. Potable tap water for decontamination.

Personnel Decontamination Solutions

Personnel will generally use household soap and water. The detergents Alconox or Liquinox and water are the preferred surfactants for most decontamination procedures relating to equipment. Selection of specific solvents and decontamination solutions are to be defined in the site work plan.

The effectiveness of decontamination solutions will be continuously verified. Visual observations of discoloration, stains, and arid substances adhering to objects, are indications that the decontamination solution is not effective in removing contamination. Decontamination solutions must be replenished frequently with use, to ensure their continued effectiveness.

The quality of rinse water used in the decontamination process shall be verified. A distilled/deionized rinse is the final step in the decontamination of equipment and in removing all traces of contaminants.

Personnel Decontamination

Personnel decontamination procedures depend on the level of personal protection worn by the field crew, as required by the Site-specific Health and Safety Plan, and upon the degree of contamination the crewmembers experience. The objective of personal decontamination is to protect the health of all crewmembers and to prevent the spread of contamination from the site. Therefore, the following procedures should be extended and modified by the SHSO until all field personnel are satisfied that complete decontamination has been accomplished. In the event of an emergency, the SHSO may judge it necessary to curtail these decontamination procedures to evacuate the site or initiate First Aid.

- **Level B Decontamination:** Level B personal protection equipment (PPE) includes chemical-resistant disposable coveralls, SCBA, hardhat, steel-toe/shank boots, boot covers, and inner and outer gloves. Level B decontamination procedures also can be divided into four sublevels: (1) highly-contaminated personnel exiting the Exclusion Zone, (2) minimally-contaminated personnel exiting the Exclusion Zone, (3) highly-contaminated personnel crossing the hot line to exchange SCBA tank, and (4) minimally-contaminated personnel crossing the hot line to exchange SCBA tank. These distinctions are noted in the decontamination station descriptions below.
    - ➢ <u>Station 1 – Segregated Equipment Drop (All Sublevels)</u>: Before crossing the hot line, personnel returning from the field must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly-contaminated equipment, such as samplers and sample containers, are kept separate from minimally-contaminated and difficult-to-clean equipment, such as air monitoring equipment.

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- Station 2 – Boot Cover and Outer Glove Wash, Rinse, and Removal: Personnel must step into a washtub containing a detergent solution. Boot covers and outer gloves are scrubbed with a long-handled, soft-bristled brush. All surfaces of the boots and gloves are washed, including boot soles and duct tape used to seal covers and gloves to coverall. Boot covers, including soles and outer gloves, are rinsed with a long-handled, soft-bristled brush. Tape is removed from boat covers and outer gloves and deposited into a plastic-lined disposal drum. Boot covers, and outer gloves are removed and deposited into a plastic-lined disposal drum. A knife may be used to aid in the removal of tight-fitting boot covers.

- Station 3 – Coverall, SCBA, and Safety Boot Wash and Rinse: At this station, all exposed surfaces of PPE are washed with the detergent solution. Personnel must step into a washtub containing a detergent solution. All gear is scrubbed with a long-handled, soft-bristled brush. All surfaces of gear should be scrubbed, including boot soles, until visible contamination is removed. All exposed surfaces of PPE are rinsed to remove detergent.

  Personnel must step into a washtub containing tap water. All gear is rinsed with a long-handled, soft-bristled brush. Pressure sprayers containing tap water may be used to aid in rinsing.

- Station 4 – Safety Boot, SCBA Backpack, and Chemically-Resistant Overall Removal: Boots must be removed and set on plastic sheeting. While still wearing the face-piece, the SCBA backpack is removed and set on a chair or table. The air supply hose is disconnected from the regulator valve. Chemically-resistant overalls are removed and disposed to a plastic-lined disposal drum.

- Station 5 – Inner Glove Wash and Rinse and SCBA Face Piece Removal: Inner *gloves are scrubbed by rubbing hands together with a detergent solution then rinsed* in tap water. The SCBA face piece is removed without touching inner gloves to face. Deposit face piece on plastic sheeting.

- Station 6 – Inner Glove Removal: Inner gloves are removed and disposed to a plastic-lined disposal drum.

- Station 7 – Field Wash/Field Shower: Hands and face are washed with hand soap, then rinsed and dried with paper towels. If highly–toxic, skin-corrosive, or skin-absorbable materials are at the site, shower entire body.

• **Level C Decontamination:** Level C personal protection includes chemical-resistant disposable coverall, APR, hardhat, steel-toe/shank boots, boot covers, and inner and outer gloves. Depending on exposure hazards, boot covers and outer gloves may not be required, and Tyvek coveralls may be substituted for chemical-resistant coveralls. Station decontamination activities include the following:

  - Station 1 – Segregated Equipment Drop: Before crossing the hot line, personnel returning from the field must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly-contaminated equipment, such as samplers and sample containers, are kept separate from minimally-contaminated and difficult-to-clean equipment, such as air monitoring equipment.

- Station 2 – Boot Covers and Outer Glove Wash, Rinse, and Removal: Personnel must step into a wash tub containing a detergent solution. Boot covers and outer gloves are scrubbed with a long-handled, soft-bristled brush. All surfaces of the boots and gloves are washed including boot soles and duct tape used to seal covers and gloves to coveralls.

  Personnel must step into a washtub containing tap water. Boot covers, including bottoms and outer gloves, are rinsed with a long-handled, soft-bristled brush. Tape that seals boot covers and outer gloves is removed and deposited into a plastic-lined disposal drum. Boot covers and outer gloves are removed and deposited into a plastic-lined disposal drum. A knife may be used to aid in the removal of tight-fitting boot covers.

- Station 3 – Safety Boots and Coveralls Wash, Rinse, and Removal: Personnel must step into a wash tub containing a detergent solution. Boots are scrubbed with a long-handled, oft-bristled brush. If leather safety boots are worn, the soles are scrubbed and the upper surfaces are wiped with a paper towel dipped in detergent solution. If waterproof coveralls are worn, they are scrubbed also. All surfaces of gear, including boot soles, are scrubbed until visible contamination is removed.

  Personnel must step into a washtub containing a tap water. Boots and coveralls are rinsed with a long-handled, soft-bristled brush. Boots are removed and set on plastic sheeting. Coveralls are removed and disposed to a plastic-lined disposal drum.

- Station 4 – Inner Glove Wash and Rinse: Inner gloves are scrubbed by rubbing hands together with a detergent solution. Finish with a rinse in tap water.

- Station 5 – APR and Inner Glove Removal: The APR is removed without touching inner gloves to face, and then deposited on plastic sheeting. Inner gloves are removed and disposed to a plastic-lined disposal drum.

- **Level D Decontamination:** Level D is the lowest level of personal protection and is worn when exposure to contaminants is not expected. Level D personal protection includes hardhat and steel-toe/shank leather boots. Depending on the anticipated activities, Level D may also include Tyvek coveralls and gloves. Station decontamination activities include the following:

  - Station 1 – Segregated Equipment Drop: Personnel returning from the field must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly-contaminated equipment, such as samplers and sample containers, are kept separate from minimally-contaminated and difficult-to-clean equipment, such as air-monitoring meters.

  - Station 2 – Safety Boot Wash, Rinse, and Removal: Boot soles must be scrubbed with a long-handled, soft-bristled brush. All surfaces of gear, including boot soles, must be scrubbed until visible contamination is removed. Boot soles are rinsed with tap water using a long-handled, soft-bristled brush. Boots are removed and set on plastic sheeting.

- Station 3 – Coveralls Removal (if needed): If worn, remove coveralls and dispose to a plastic-lined disposal drum.

- Station 4 – Glove Wash, Rinse, and Removal (if needed): If worn, inner gloves are scrubbed by rubbing hands together with a detergent solution. Finish with a rinse in tap water. Gloves are removed and disposed to a plastic-lined disposal drum.

Priorities for Worker Decontamination

The following members of the work team returning from the Exclusion Zone shall have priority over others when being decontaminated.

- A worker who is in need of First Aid, or is in physical discomfort.
- A worker who is low on air or whose SCBA is malfunctioning.
- A worker who has been highly contaminated.
- A worker who did the major part of physical activity required on site.

It is the responsibility of the SHSO to decide which workers receive priority.

Emergency Decontamination

In an emergency, the primary concern shall be to prevent the loss of life or severe injury to personnel. If immediate administration of medical treatment is required to prevent further deterioration of health, then decontamination may be eliminated, modified, or performed later when the condition has stabilized. The SHSO and the team leader must weigh the consequences of delaying, modifying, or eliminating decontamination against the consequences of delaying treatment, before making a decision on a case-by-case basis.

First Aid equipment shall be readily available in the Support Area and, as specified in the Site-specific HSP. At least one response team member shall be trained in First Aid and CPR.

Arrangements shall be made to advise medical personnel on the nature of contaminants to which the patient was exposed and the extent of decontamination. In some cases, the SHSO will need to contact nearby emergency response medical facilities in advance to alert them of the possibility of a problem. This will help the medical facility to prepare for the specific sort of health care that may be required in an emergency.

Cold Weather Decontamination

In freezing temperatures, a small quantity of ethanol can be added to the washtubs containing decontamination and tap water to prevent freezing. Deionized water and distilled water containers shall be kept warm in the heated van or car for use when needed. Orchard sprayers shall also be kept in a warm place when not in use.

5.0 Decontamination of Equipment

Protection of Monitoring Instruments

All equipment and monitoring instruments shall be protected from contamination while in use by wrapping them in clean plastic bags and sealing them with tape.

Heavy Equipment

Heavy equipment like bulldozers, trucks and drilling equipment are difficult to decontaminate. Decontamination shall consist of either steam cleaning or washing with suitable detergent solutions and then water under high pressure. Decontamination equipment that may be needed include long-handled brushes, pressurized sprayers, curtains and enclosures to contain splashes from pressurized sprayers, and wire brushes. A decontamination pad lined with heavy-duty plastic sheeting may be needed for the decontamination of heavy equipment.

Tools/Sampling Equipment

Disposable tools shall be used wherever possible. Typically, decontamination of tools will include brushing with decontamination solution followed by tap water. This procedure shall be followed by spraying with distilled water and then deionized water. The tools shall be segregated and wrapped in clean plastic bags and taped securely.

Decontamination of sampling equipment such as split spoons, stainless steel buckets, and filtration transfer vessels shall be in accordance with the following steps:

- Set up clean tubs or buckets to collect wash and rinse solutions.
- Scrub item with Alconox or Liquinox and water until visually clean. Use Liquinox when phosphate is an analytical parameter.
- Rinse with tap water.
- Rinse with distilled or deionized water, the variety that can be found in any grocery store. A garden sprayer or squirt bottles may be used.

6.0 Level of Protection for Decontamination Team

Decontamination workers who initially come into contact with personnel and equipment returning from the Exclusion Zone shall be required to wear the same level of protection as the returning team, or one level lower. The level of protection for decontamination workers can be progressively decreased, without compromising worker safety, the further away the stations are located from the hot line. The SHSO shall determine the level of protection required for the decontamination team.

7.0 Investigation-Derived Waste

SOP HS-006 contains more detail on disposal of decontamination solutions and other decontaminated items such as paper towels and Tyvek. Typically, the wash tubs containing decontamination solution and rinse water shall be emptied into DOT-approved drums. The wash tubs shall be sprayed with decontamination solution and tap water, and then also emptied into the drums. All solid waste shall be double-bagged and disposed of in drums. The drums shall be securely fastened and labeled as "decontamination water" or "solid waste." Include the name of the site, the date, the company name, and the level of fullness.

Standard Operating Procedures

HEAT STRESS

Prepared By: ______________________ Date: ____________
Health and Safety Committee Chair

Reviewed By: ______________________ Date: ____________
Corporate Health and Safety Officer

Approved By: ______________________ Date: ____________
Chief Operating Officer

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines to protect all employees from the effects of heat stress (hyperthermia) when working in hot environments.

2.0 Scope

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal injury, increased accident probability, and the like, to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment (PPE) puts a worker at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at sites, regular monitoring and other preventive precautions are vital.

Note

Chemical protective clothing is defined as, but not limited to:

- Uncoated Tyvek coveralls.
- Polyethylene-coated Tyvek coveralls.
- Saranex-coated Tyvek coveralls.
- Medium-weight polyvinyl chloride (PVC) coveralls.
- Sigel suits (heavyweight PVC) and fully-encapsulating suits.

3.0 Responsibilities

The responsibilities of various personnel on the project site for monitoring and responding to various types of heat stress are provided below:

- **Site-specific Health and Safety Officer:** The Site-specific Health and Safety Officer (SHSO) is responsible for initial on-site coordination of the heat stress policy. The SHSO establishes work/rest regimens from the Wet Bulb Globe Thermometer (WBGT) readings and conducts physiological monitoring when on site.

- **Project Manager:** The Project Manager is responsible for field implementation of the heat stress policy. This includes assurance that all personnel on site comply with the policy. The Project Manager shall be responsible for establishing and monitoring safe work practices. He/she will ensure that all personnel potentially exposed to heat have proper training and that the on-site Project Supervisor implements the program in his/her absence.

- **Project Supervisor:** The Project Supervisor is responsible for ensuring that work crews comply with all site requirements, including the heat stress policy. In the absence of the Site-specific Health and Safety Officer, the Project Supervisor is also responsible for physiological monitoring.

- **Team Member:** Team Members are responsible for understanding and complying with all site requirements, including the heat stress policy. Team members shall also observe their fellow workers for signs of heat stress.

Project Managers, Project Supervisors, and SSHOs will plan for heat by providing shaded break areas, time for acclimatization, and plenty of palatable beverages for personnel.

4.0 Procedures

Recommended Guidelines

Note that the guidelines discussed in this section are intended to be used only as a means of establishing an initial work/rest regimen. The Site-specific Health and Safety Officer is responsible for evaluating the conditions at a specific operation and making final determinations of the work/rest regimen. Physiological monitoring, as discussed in the following section, will be used to establish more stringent regimens.

Standard guidelines for physiological monitoring of specific types of project personnel are provided below:

- **Unacclimatized Workers:** The total heat exposure to unacclimatized workers not wearing protective clothing shall not exceed the guidelines given in Figure 1 (located at the end of this SOP). Note that it generally takes an employee 7 to 10 days to become acclimated to heat.

- **Acclimatized Workers:** The total heat exposure to acclimatized healthy workers not wearing protective clothing shall not exceed the guidelines given in Figure 2 (located at the end of this SOP).

- **Workers Not Wearing Chemical-protective Clothing:** The guidelines shown in Figures 1 and 2 are for workers who are not wearing chemical-protective clothing. In the event workers are wearing chemical-protective clothing, the guidelines in Figures 1 and 2 should be changed to 4°F. In other words, add 4°F to the WBGT reading and use this adjusted WBGT in Figures 1 and 2. The metabolic heat rate shall be estimated using Table 1 (located at the end of this SOP).

Physiological Monitoring

For operations at which workers are wearing chemical-protective clothing, physiological monitoring is necessary when the ambient temperature exceeds 78°F (25.5°C).

After the initial work/rest regimen is established, it is necessary to perform physiological monitoring to determine if the established work/rest regime should be adjusted. The following guidelines shall be used to adjust the regimen:

- **Baseline Information:** Determine a baseline heart rate and oral temperature for each employee prior to on-site activities by counting the radial pulse and using a clinical thermometer to measure oral temperature.

- **Increasing Work Rate:** If a worker's heart rate and oral temperature do not increase, or only increase slightly (10 percent or less for the heart rate and 0.5° or less for the oral temperature) from the baseline readings after the first work cycle, the work period (according to the established work/rest regimen) can be increased by 20 percent.

  The worker shall be monitored closely after the next work cycle period, and if there are still no significant increases in heart rate and oral temperature, the work period can be increased by an additional 10 percent, and the rest period remains the same.

  Increases in the work period can be made throughout the shift if there are no significant increases in the physiological monitoring indices.

  Note that the increases to the work period are made based on the work/rest regimen established from WBGT readings. These WBGT readings will change throughout the day as the temperature rises or falls.

- **Decreasing Work Rate**

  - Pulse:

    - Count the radial pulse as early as possible in the rest period.

    - If a worker's heart rate exceeds 110 beats per minute immediately after a work period, shorten the next work cycle by 30 percent and keep the rest period the same.

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- If the heart rate still exceeds the 110 beats per minute after the next work period, shorten the following work cycle by 30 percent.

- Continue to shorten the employee's work cycle until the heartbeat is below 110 beats per minute.

- <u>Temperature</u>:

  - Use a clinical thermometer or similar device to measure the oral temperature at the end of a work period (before drinking).

  - If the oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by 30 percent without changing the rest period.

- If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the following work cycle by 30°percent.

- Do not permit a worker to return to a work area when the worker's oral temperature exceeds 100.6°F (38.1°C).

Prevention

Establish a work/rest regimen according to the guidelines presented in this policy.

Adequate liquids must be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

Replacement fluids can be a commercial mix, such as Gatorade or similar, or a combination of these with fresh water.

The replacement fluid temperature should be kept cool.

Cooling devices, such as vortex tubes or cooling vests, can be worn beneath protective garments. If cooling is worn, only physiological monitoring will be used to determine work activity.

All breaks are to be taken in a cool, shaded rest area.

Employees shall open or remove chemical-protective garments during rest periods.

Employees shall not be assigned other tasks during rest periods.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress.

Employees shall be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.

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Training

Those personnel (including contractor employees) potentially exposed to heat stress conditions shall receive the following training:

- **Parametrix Employees**
  - Sources of heat stress, the influence of protective clothing, and the importance of acclimatization.
  - How the body handles heat.
  - Heat-related illnesses.
  - Preventive/corrective measures.
  - First Aid procedures.
- **Parametrix Supervisors**
  - Measurement methods and calculation of WBOT and physiological monitoring.

5.0 References

Threshold Limit Values and Biological Exposure indices for 1985/1986. American Conference of Governmental Industrial Hygienists.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. NIOSH/OSHA/USCG/EPA, Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

Criteria for a Recommended Standard, Occupational Exposure to Hot Environments, Revised Criteria 1986, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

INSERT FIGURE 1 – RECOMMENDED HEAT STRESS GUIDELINES FOR ACCLIMATED WORKERS IN HOT ENVIRONMENTS

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INSERT FIGURE 2 – RECOMMENDED HEAT STRESS GUIDELINES FOR UNACCLIMATED WORKERS IN HOT ENVIRONMENTS

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Table 1. Assessment of Employee Work Load in Hot Environments

Body Position and Movement		kcal per hour
Sitting		18
Standing		36
Walking		120-180
Walking Uphill		Add 48 per meter rise
Type of Work	**Average kcal per minute**	**Range kcal per hour**
Hand Work		
• Light	24	12-72
• Heavy	54	
Work One Arm		
• Light	60	42-150
• Heavy	108	
Work Both Arms		
• Light	90	60-210
• Heavy	150	
Work Whole Body		
• Light	210	150-540
• Moderate	300	
• Heavy	420	
• Very Heavy	540	
Basal Metabolism	**60**	
Sample Calculation	**Average kcal per minute**	
Assembling Work with Heavy Hand Tools		
• Standing	36	
• Two-Arm Work	210	
• Basal Metabolism	60	
Total:	**306 kcal per hour**	

APPENDIX D

Non-ACM Waste Management Plan

Non-ACM Waste Management Plan
North Ridge Estates Remedial Investigation

Prepared for

U.S. Environmental Protection Agency
Oregon Operations Office
811 S.W. 6th Avenue, 3rd Floor
Portland, OR 97204

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1. INTRODUCTION

This Waste Management Plan (WMP) was prepared to support drilling activities at the North Ridge Estates (NRE) site in Klamath Falls, Oregon.

The purpose of this WMP is to describe methods and procedures to manage potentially non-asbestos contaminated soil and decontamination water during drilling activities at the site. It is expected that up to six 55-gallon steel drums of drill cuttings and four 55-gallon steel drums of decontamination water will be generated during drilling activities. Management procedures discussed in this WMP have been developed to be consistent with general Oregon Department of Environmental Quality (DEQ) rules and regulations and potential site-specific conditions to be identified during a Risk Investigation (RI) to be completed at the site. In general, data regarding site conditions will be obtained during the RI.

This WMP should be supplied to all subcontractors at the site which have the potential to generate potentially contaminated waste during drilling activities. A copy should be kept at the project construction office for reference for the duration of drilling activities.

2. BACKGROUND

The NRE site is located approximately 3 miles north of the city of Klamath Falls, in Klamath County, Oregon, on Old Fort Road and North Ridge Drive (Figure 1). The site is the former location of a Marine Recuperation Barracks (MRB) and the Oregon Technical Institute (OTI). While the city of Klamath Falls is at an elevation of 4,100 feet, the NRE site sits at an elevation of 4,800 feet. Peaks surrounding the site are as high as 5,360 feet to the east and 5,460 feet to the west.

According to Klamath County tax lot records, land purchased for the NRE subdivision includes parcels in Sections 15 and 14, Township 38 South, Range 9 East, and covers approximately 422 acres. The NRE parcels in Section 15 comprise approximately 250 acres and include properties along Old Fort Road, Hunter's Ridge Drive, North Ridge Drive, and Thicket Court, as well as several parcels on Scott Valley Road. In addition, parcels in Section 14 (14-500, 14-600, 14-700, 14-800, 14-801, and 14-900), described as "North Ridge Estates 3rd Addition," comprise 172.44 acres of the NRE subdivision.

The developed area of the subdivision along Old Fort Road and North Ridge Drive currently includes 23 single-family homes, 8 undeveloped vacant lots, a warehouse, and a memorial park.

The main contaminant of concern (COC) at the NRE site is asbestos. Due to former demolition practices at the site, asbestos-containing material (ACM) was buried and scattered throughout the site. The types of ACM that are present at the site include: CAB, vinyl asbestos tiles (VAT), floor tile mastic, roofing material, and insulation (AirCell and MAG) and tar paper used in steam piping. Air-Cell is a type of thermal system insulation (TSI); it consists of a corrugated asbestos paper product used as an outer coating for pipe insulation. The TSI material known as MAG, so called because the major asbestos content in the product is a magnesium silicate, was used to insulate high temperature utilities such as steam or condensate lines. Based on past operations and practices at the site, other potential chemicals of potential concern (COPCs) include polychlorinated biphenyls (PCBs), lead and other metals, petroleum hydrocarbons, dry cleaning solvents, and other volatile and semi-volatile organic compounds (VOCs, SVOCs).

Several ACM investigations and removals have been performed at the site. However, non-asbestos contaminant investigations have been limited.

2.1 PHYSICAL SETTING

The location of the site, in an area of transition between the Cascade Mountains and the Basin and Range provinces, results in complex geology. The Klamath Basin is primarily composed of volcanic deposits with lowland fluviolacustrian deposits that have been described as consolidated volcanic rocks consisting largely of lava; unconsolidated to semi-consolidated volcanic ejecta deposited around eruptive centers; and lowland fluviolacustrian deposits consisting of dolomite, water-lain volcanic sediment, tephra, and lava (U.S. Geological Survey [USGS] 1999b).

According to the National Resources Conservation Service (NRCS) soil survey of Klamath County (NRCS 1985) three main soil types are present at the site: Royst stony loam, 5 to 40 percent north slopes; Royst stony loam, 5 to 40 percent south slopes; and Woodcock association, north.

2.2 HYDROGEOLOGIC CONDITIONS

It is anticipated that groundwater will not be encountered during drilling activities.

3. RISK INVESTIGATION SUMMARY

The main contaminant of concern (COC) at the NRE site is ACM. As a result of former demolition practices at the site, ACM was buried and scattered throughout the site.

In addition, use of the site, including the operation of the barracks and the college campus, included activities that have been occasionally associated with the release of non-ACM COPCs at other sites. Although there is no indication that such releases at NRE occurred at this time, areas of potential concern will be investigated during the RI to determine the presence of COPCs and to rule out their presence where these constituents do not exist.

3.1 ACM

The types of ACM that have been found at the NRE site include: cement asbestos board (CAB), vinyl asbestos floor tile (VAT), floor tile mastic, roofing material, and insulation (Air-Cell and MAG) and tar paper used in steam piping.

Bulk samples of ACM found at the site indicate chrysotile and amosite are the two main types of asbestos present in ACM at the site. Table 1 summarizes the asbestos concentrations observed in ACM at the site (E & E 2006).

Table 1. Summary of Asbestos Content of ACM

Material Type	Asbestos Type	Percent Asbestos
CAB	Chrysotile	3 – 25
Roofing Material	Chrysotile	30 – 45
VAT	Chrysotile	<1 – 10
AirCell	Chrysotile	35 – 40
MAG Insulation	Chrysotile	3 – 25
	Amosite	20 – 55
Tar Paper	Chrysotile	35 – 40

Maximum concentrations of asbestos observed in onsite media are shown in Table 2.

Table 2. Maximum Concentrations of Asbestos Observed

Media	Asbestos Type	Percent Asbestos Concentration
Cement Asbestos Board	Chrysotile	25%
Vinyl Asbestos Floor Tile	Chrysotile	10%
Roofing Material	Chrysotile	40%
Air Cell as Steam Pipe Insulation	Chrysotile	40%
MAG as Steam Pipe Insulation	Chrysotile	25%
	Amosite	55%
Surface Soil	Chrysotile	0.21%
	Amosite	0.05%
Outdoor Air	Chrysotile	1.0E-03 S/cc*
	Actinolite	1.0E-03 S/cc*
Indoor Air	Chrysotile	1.0E-04 S/cc*
	Amosite	1.0E-04 S/cc*

Notes: S/cc – structures per cubic centimeter; * - Concentrations are equal to the analytical sensitivity

ACM exists at the site in burial piles, mounds, and pits. ACM is found in the surface and subsurface soils, and has been observed at depths as great as 10 feet below ground surface.

3.2 NON-ASBESTOS CHEMICALS OF POTENTIAL CONCERN

Candidate non-asbestos COPCs include the following:

- **Volatile organic compounds (VOCs) in solvents that were used as degreasers or parts cleaners** – These contaminants have been found at other sites as a result of operations or disposal of used material.
- **Total petroleum hydrocarbons (TPH)** – oil and grease compounds also associated with machinery operations.
- **Polychlorinated biphenyls (PCBs)** – typically associated with electrical equipment, but also with a relatively broad array of uses as stabilizers.
- **Semi-volatile organic compounds (SVOCs)** – heavy organics associated with power plant operations.
- **Pesticides** – constituents such as dichloro-diphenyl-trichloroethane (DDT), used for control of insects and other pests.
- **Metals** – constituents such as lead, which had a variety of uses including paint and leaded gasoline.

Background information on the site and its usage was evaluated to determine if the historical activities might have led to non-asbestos COPCs being released to the environment. Based on current background information, a number of historical areas of potential non-asbestos COPC releases were possible. These areas and the related potential non-asbestos COPCs are summarized as follows:

- **Former central power plant** – possible VOCs due to use for degreasing and cleaning operations; possible TPH and/or PCBs due to mechanical operations;

possible SVOCs from coal-firing operations and coal storage; and/or possible mercury due to electrical equipment and boiler control equipment.

- **Former maintenance/repair shop** – possible VOCs due to use in degreasing and cleaning operations; and/or possible TPH and/or metals from machining and other operations.
- **Former OTI maintenance shop** – possible VOCs due to use in degreasing and cleaning operations; and/or possible TPH and/or metals from machining and other operations.
- **Former laundry building** – possible VOCs and/or SVOCs from past operations.
- **Landfill** – possible VOCs from past disposal; possible SVOCs, TPH, PCBs, pesticides, and/or metals from past disposal practices; possible wastes from past medical laboratory disposal practices.
- **Former gas station** – possible diesel, gasoline, motor oil, and/or used oil; possible VOCs, PAHs, and/or metals related to used oil.
- **Former paint shops** – possible VOCs, SVOCs, and/or metals from use of paint and solvents, and past disposal practices.
- **Former fire station** – possible petroleum fuels and/or motor oil from fire engine and equipment maintenance.

4. HEALTH AND SAFETY REQUIREMENTS

The Contractor is required to develop a site health and safety plan (HASP) under its contract with EPA. The Contractor will supply a copy of its HASP to the Subcontractor; however the Subcontractor shall develop and implement its own HASP as well. The Subcontractor may use Contractor's HASP as a guide to outline the minimum requirements of the Subcontractor's HASP, but the Contractor does not represent or warrant that its HASP is an adequate or complete guide for the Subcontractor's work; and the Subcontractor remains fully responsible for the adequacy and completeness of its own HASP.

4.1 SUBCONTRACTOR HEALTH AND SAFETY PLANS

The Subcontractor shall develop and implement its own HASP prior to work on the Site, and is fully responsible for the implementation and maintenance of the requirements of the HASP. Subcontractor's HASP shall be consistent with the following minimum requirements:

- Occupational Safety and Health Administration (OSHA) Safety and Health Standards 29 CFR 1910 (General Industry). U.S. Department of Labor, Occupational Safety and Health Administration. Hereafter referred as 29 CFR 1910.
- OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response. U.S. Department of Labor, Occupational Safety and Health Administration.
- OSHA 29 CFR 1926 Safety and Health Regulations for the Construction Industry. U.S. Department of Labor, Occupational Safety and Health Administration.
- Standard Operating Safety Guidelines. EPA Office of Emergency and Remedial Response Publication 9285.1-03. Hereafter referred to as EPA Guidelines.

- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health.

4.2 ADOPTION OF SITE HEALTH AND SAFETY PLAN

If the Subcontractor's work is essentially the same as that described in the Contractor's HASP, the Subcontractor may elect to use the provisions of the Contractor's HASP in its entirety. If the Subcontractor adopts the Contractor's HASP, the Subcontractor shall acknowledge this with the signature of a designated representative on a letter accepting the HASP. The letter shall be provided prior to commencing work activities. The Contractor does not warrant that the HASP will be sufficient for the Subcontractor's work. The Subcontractor must make an independent determination of the applicability of the HASP to the Subcontractor's work and must comply with all applicable statues, regulations, and codes.

If the Subcontractor adopts the HASP, it becomes the responsibility of the Subcontractor to implement the plan as it pertains to the Subcontractor's work. The Subcontractor assumes all liabilities from such adoption and implementation. However, if the Subcontractor develops a HASP, the Subcontractor shall provide it to the Contractor for review within 5 days after award of this Subcontract, or at least 5 days prior to commencement of operations at the job site.

All Subcontractor employees involved with onsite work shall be required to read and understand the requirements in the HASP and sign the acknowledgement form contained in the HASP. The Subcontractor assumes all liabilities associated with the implementation of the HASP.

4.3 MODIFICATIONS TO THE HEALTH AND SAFETY PLANS

Should the Contractor modify any portion or provision of the HASP, the Contractor will notify the Subcontractor in writing of such modifications. Should the Subcontractor seek relief from, or substitution for, any portion or provision of Contractor's HASP, such relief or substitution shall be requested in writing.

The Subcontractor shall also quickly notify the Contractor, both verbally and in writing, of any unforeseen hazard, safety-related factor, or condition they observe during the work at the site. In the interim, the Subcontractor shall take prompt action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment in accordance with the HASP.

4.4 HEALTH AND SAFETY PROTOCOL

It is expected that sampling activities associated with this WMP will be conducted in Level C PPE, consisting of full face air-purifying respirator with P100 filter, steel toe boots, Tyvek® suit or equivalent, nitrile surgical weight gloves to be used as inner gloves, work gloves to use as outer gloves (as needed), hardhat (if overhead hazards are present), safety glasses, and hearing protection. All disposable Level C PPE will be disposed of with the ACM Level C PPE.

5. SOIL MANAGEMENT

The fundamental element of contaminated waste management is characterizing the media and determining the best management option. The process for managing soil drill cuttings from the site includes:

- Soil characterization, which will include collecting and analyzing samples
- Soil classification for disposition
- Disposition of soil drill cuttings
- Documentation of soil management

No drilling within a wetland is anticipated. Management of the soil drill cuttings is discussed in the following section.

5.1 SOIL CHARACTERIZATION AND DISPOSAL

Soil samples will be collected from each boring and analyzed for COPCs that may be present based on past activities conducted in the investigation areas. Soil cuttings from the borings will be placed into 55-gallon steel drums. Each drum will be labeled identifying the investigation area, the borings the soil cuttings came from, and the date. Drums will be temporarily stored onsite at a secure central location. If COPCs are not detected in soil samples collected from any of the borings identified on a particular drum of cuttings, then the contents of the drum will be considered clean and will be emptied onto a predetermined location at the site. If soil sample analytical results indicate soil cuttings in a particular drum from one or all of the boring soil cuttings in that drum contain elevated concentrations of any COPCs, the contents will be considered contaminated and will be disposed of at a landfill approved to receive contaminated waste.

Unexpected conditions encountered during drilling activities will be managed in accordance with the procedures outlined in Section 7.0.

5.1.1 Record Keeping

Recordkeeping associated with waste management during drilling activities will include the boring locations and quantity of material removed from each boring.

A report, with associated documentation, should be prepared at the end of the RI to document the proper management of drilling debris.

6. WATER MANAGEMENT

It is not anticipated that groundwater will be encountered during drilling activities. However, potentially contaminated wash water will be generating during decontamination of drilling equipment. Wash water from decontamination of drilling tools during ACM investigation activities will be discharged to the ground surface in the investigation areas. Wash water generated during non-ACM drilling activities will be placed into 55-gallon steel drums and temporarily stored onsite with the soil drums, pending analytical results, at a location to be determined. The water drums will be labeled identifying the investigation area (e.g., Paint Shops), the borings the wash water was generated from (e.g., PS-1 through PS-6), and the date. If soil analytical results indicate that there are no COPCs in the borings identified on a water drum label, the water in that drum will be placed on the ground surface at the site. If

COPCs are detected, the water will be disposed of by a licensed disposal and recycling facility.

7. UNEXPECTED CONDITIONS

There is potential that unexpected conditions could be encountered during drilling activities. The unexpected conditions include encountering pockets or layers of ACM, underground storage tanks (USTs), drums, and/or greasy, odorous, or discolored soil. If unexpected conditions or contamination is identified during drilling activities, the contractor should take the following steps:

1) Stop Work. Stop all work in the area until appropriate health and safety procedures can be established.

2) Health and Safety. Ensure the health and safety of site workers and the general public in the vicinity of the site. Manage initial response in accordance with all OSHA regulations for worker safety, including 29 CFR 1910.120. Any contaminant media handling, removal or investigation will be overseen by an environmental professional.

3) Obtain Initial Information. Immediately collect the information detailed below. The information should be obtained by a qualified environmental professional in coordination with Parametrix (see #4 below).
   a) Description of the contamination, including visual observations and odor
   b) Location and extent of contamination identified to date
   c) Contaminated media identified
   d) Potential source(s) of contamination, if any can be identified
   e) Name and contact information of person identifying contamination

4) Immediately report the information to EPA, Parametrix, and CDM to determine appropriate steps for assessing and managing the contamination.

Report To:		Phone	E-mail	Fax
Parametrix	Brad Hermanson	503-736-4805	bhermanson@parametrix.com	503-233-4825
Parametrix	John Howland	503-736-4817 (b) (6) 9 (cell)	jhowland@parametrix.com	503-233-4825
CDM	Dee Warren	720-264-1121 (b) (6) (cell)	warrendee@cdm.com	303-295-1895
EPA	Alan Goodman	503-326-3685	goodman.alan@epa.gov	

EPA, in coordination with Parametrix and CDM, will determine the appropriate measures to be implemented at the site, including reporting to DEQ, health and safety precautions, procedures for removing and/or managing the material, and follow-up investigation or documentation.